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BELL SOUND MODEL 2122C

PROPERTY OF
L. F. BLANKENSHIP
3924 MERDE ST.
DENVER, COLORADO

BELL SOUND
MODEL 2122C

BELL SOUND
MODEL 2122C

TRADE NAME	Bell Sound Model 2122C
MANUFACTURER	Bell Sound Systems, Inc., 555 Marion Rd., Columbus, Ohio
TYPE SET	AC Operated 4 Channel 10 Watt Audio Amplifier
TUBES (Six)	Types 6SC7 Preamp., 6SC7 AF Amp., 6SL7GT AF Amp-Phase Inverter, (2) 6V6GT Output, 5Y3GT Rectifier
POWER SUPPLY	110-120 Volts AC - 50/60 Cycles RATING .63 Amp. @ 117 Volts AC

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PARTS LIST AND DESCRIPTIONS

BELL SOUND MODEL 2122C

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: Bell Sound PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	Preamp.	6SC7	6SC7	8S	
V2	AF Amp.	6SC7	6SC7	8S	
V3	AF Amp. - Phase Inverter	6SL7GT	6SL7GT	8BD	
V4	Audio Output	6V6GT	6V6GT	7S	
V5	Audio Output	6V6GT	6V6GT	7S	
V6	Rectifier	5Y3GT	5Y3GT	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: Bell Sound PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.
C1A	▲40	450				FP369.1	TM-3059	T-715
B	■40	450						
C	▲40	50						
C2A	▲20	450				FP234	TM-D20-450	D-215
B	■20	450				TC39	TD-50-50	FM-0550
C	50	50						
C3	10	25				TC22	TD-10-25	MMT-0210
C4	.05	400		DF-503		PT415	IMP4-S5	
C5	.004	600				MCB463		
C6	.02	400		DF-203	817-02	PT412	IMP4-S2	
C7	.05	400		DF-503		PT415		
C8	.001	400			811-102	MCB255		
C9	.003	400		D6-302	811-003	PT623	IMP6-D3	
C10	.05	400		DF-503		PT415	IMP4-S1	
C11	.02	400		DF-203	817-02	PT412	IMP4-S2	
C12	220	500		TCZ-220	811-221			
C13	.002	400				MCB457		
C14	.001	600			811-102	MCB255		
C15	.01	400				MCB475		
C16	100	500		TCZ-100	801-101	MCB235		
C17	.05	400		DF-503		PT415	IMP4-S5	
C18	.05	400		DF-503		PT415	IMP4-S5	
C19	.05	400		DF-503		PT415	IMP4-S5	

CONTROLS

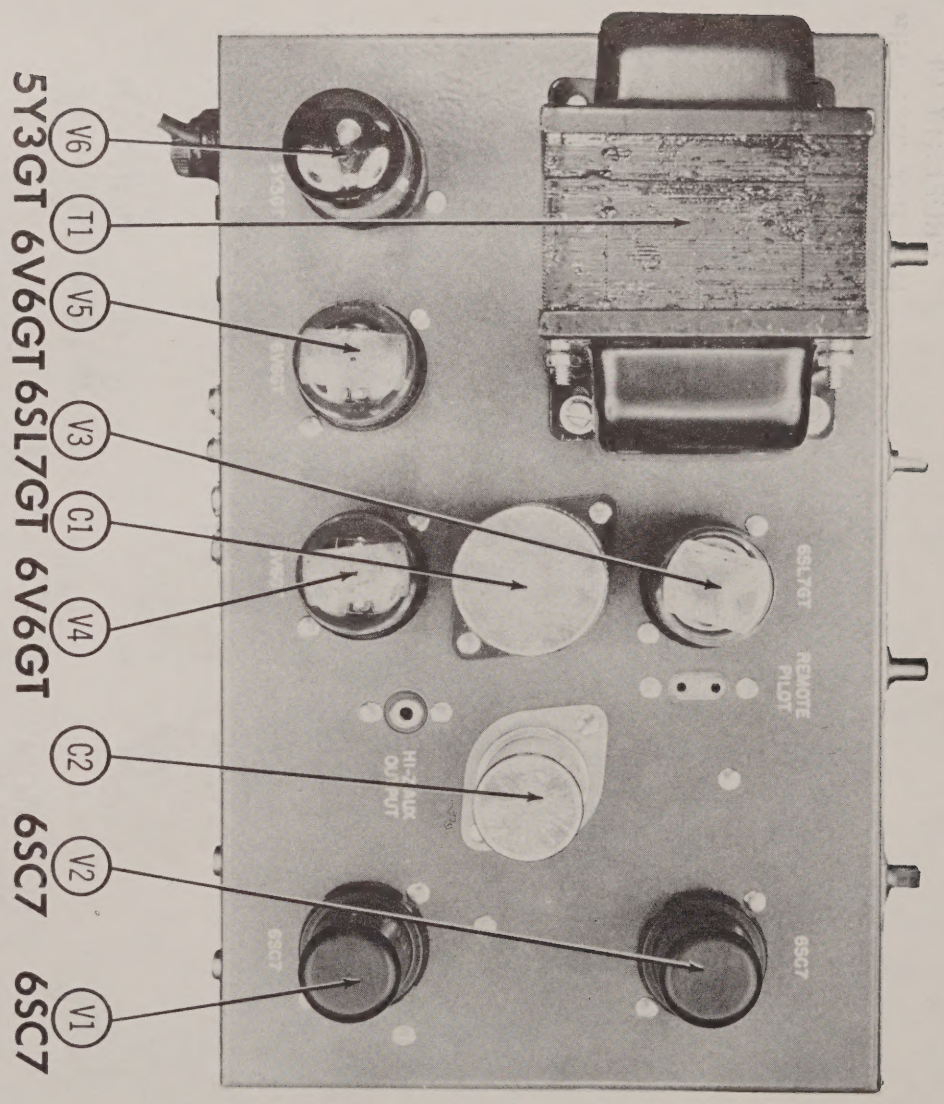
ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: Bell Sound PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2Meg	½	B20066P103	Q13-139	A47-2Meg-Z	B-76-S	U-55	Treble
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWE-12	Not Req.	US-26	Attach to R1A
R2A	2Meg	½	B20066P102	Q13-139	A47-2Meg-Z	B-76	U-55	Bass
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A
R3A	100KΩ	½	B20066P105	Q13-128	A47-100K-Z	B-41	U-39	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R3A

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: Bell Sound PART No.	IRC PART No.	NOTES
R4	27KΩ	½		BTS-27K	
R5	150KΩ	½		BTS-150K	
R6	47KΩ	½		BTS-47K	
R7	10KΩ	½		BTS-10K	
R8	10Meg	½		BTS-10Meg	
R9	27KΩ	½		BTS-27K	
R10	10Meg	½		BTS-10Meg	
R11	39KΩ	½		BTS-39K	
R12	68KΩ 5%	½		BTS-68K 5%	
R13	390KΩ	½		BTS-390K	
R14	470KΩ	½		BTS-470K	
R15	470KΩ	½		BTS-470K	
R16	2200Ω	½		BTS-2200	
R17	100KΩ	½		BTS-100K	
R18	100KΩ	½		BTS-100K	
R19	20KΩ 5%	½		BTS-20K 5%	
R20	200KΩ 5%	½		BTS-200K 5%	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: Bell Sound PART No.	IRC PART No.	NOTES
R21	47KΩ	½		BTS-47K	
R22	27KΩ	½		BTS-27K	
R23	3600Ω 5%	½		BTS-3600 5%	
R24	470KΩ	½		BTS-470K	
R25	130KΩ 5%	½		BTS-130K 5%	
R26	130KΩ 5%	½		BTS-130K 5%	
R27	10KΩ	½		BTS-10K	
R28	270KΩ	½		BTS-270K	
R29	200Ω	5		PW4-200	
R30	270KΩ	½		BTS-270K	
R31	2200Ω	½		BTS-2200	
R32	47Ω	½		BTS-47	
R33	2700Ω	1		BTA-2700	
R34	100KΩ	2		BTB-100K	
R35	1000Ω	½		BTS-1000	
R36	390Ω	½		BTS-390	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Bell Sound PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.
T1	117VAC @ .63A	640VCT .110ADC	5VAC @ 2A	6.3VAC @ 2A	B-20166	PC-8422 ① ②	P-3153	R-14A ①	P9312 ① ②	22R06 ③

① Drill new mounting holes.
② Tape 6.3V center tap.
③ Use Universal Mounting Brackets.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	Bell Sound PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	
T2	6.3KΩ CT	16Ω Tap @ 8Ω @ 4Ω	B-20229		A-3016	S-29X ①	Z1404 ①	26S59 ①	① Drill one new mounting hole.

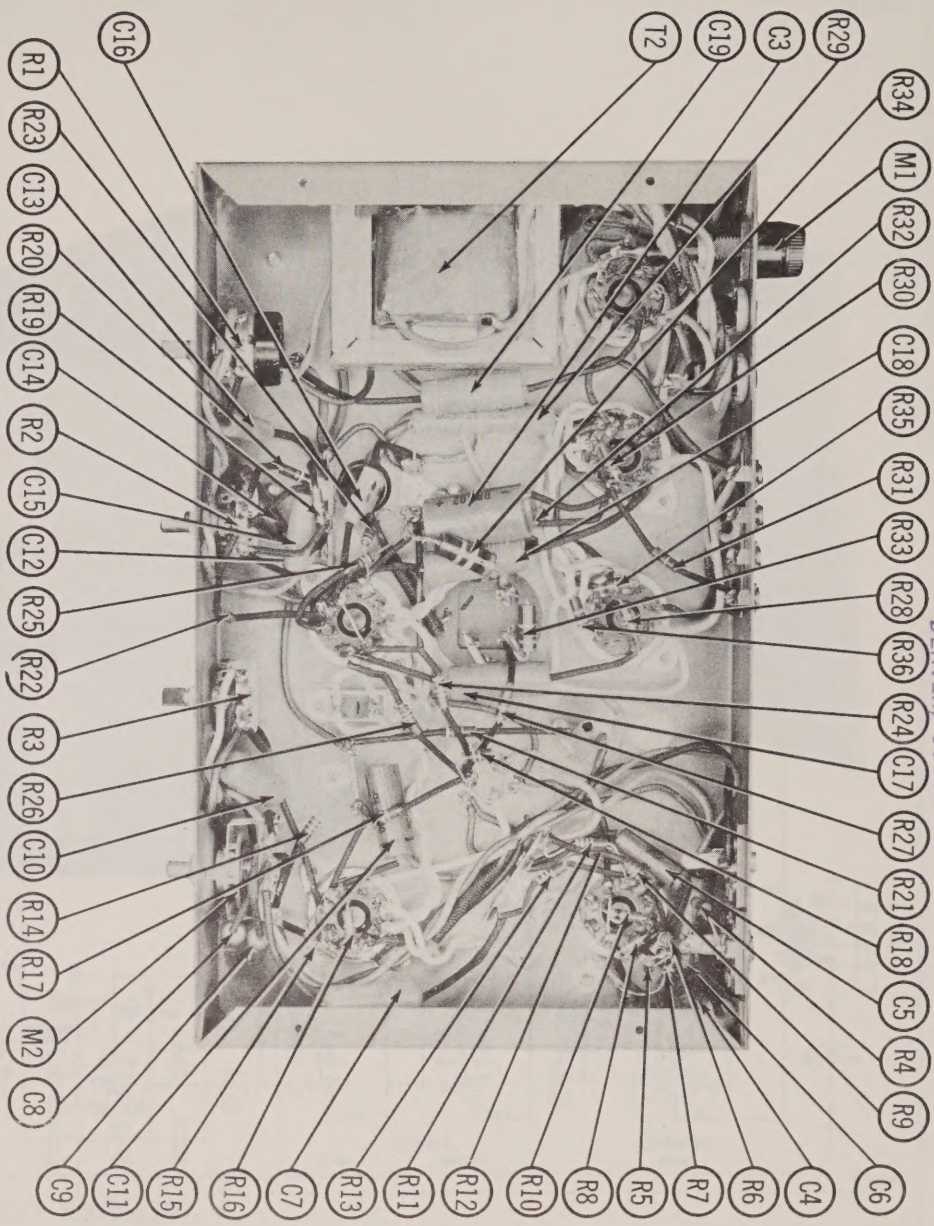
FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Bell Sound PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	2A 250V			312002 (3AG-2A)	342001	AGC2	HKP

MISCELLANEOUS

ITEM No.	PART NAME	Bell Sound PART No.	NOTES
M2	Switch		Selector - Compensation (Rotary - Wafer Type)

CHASSIS—BOTTOM VIEW



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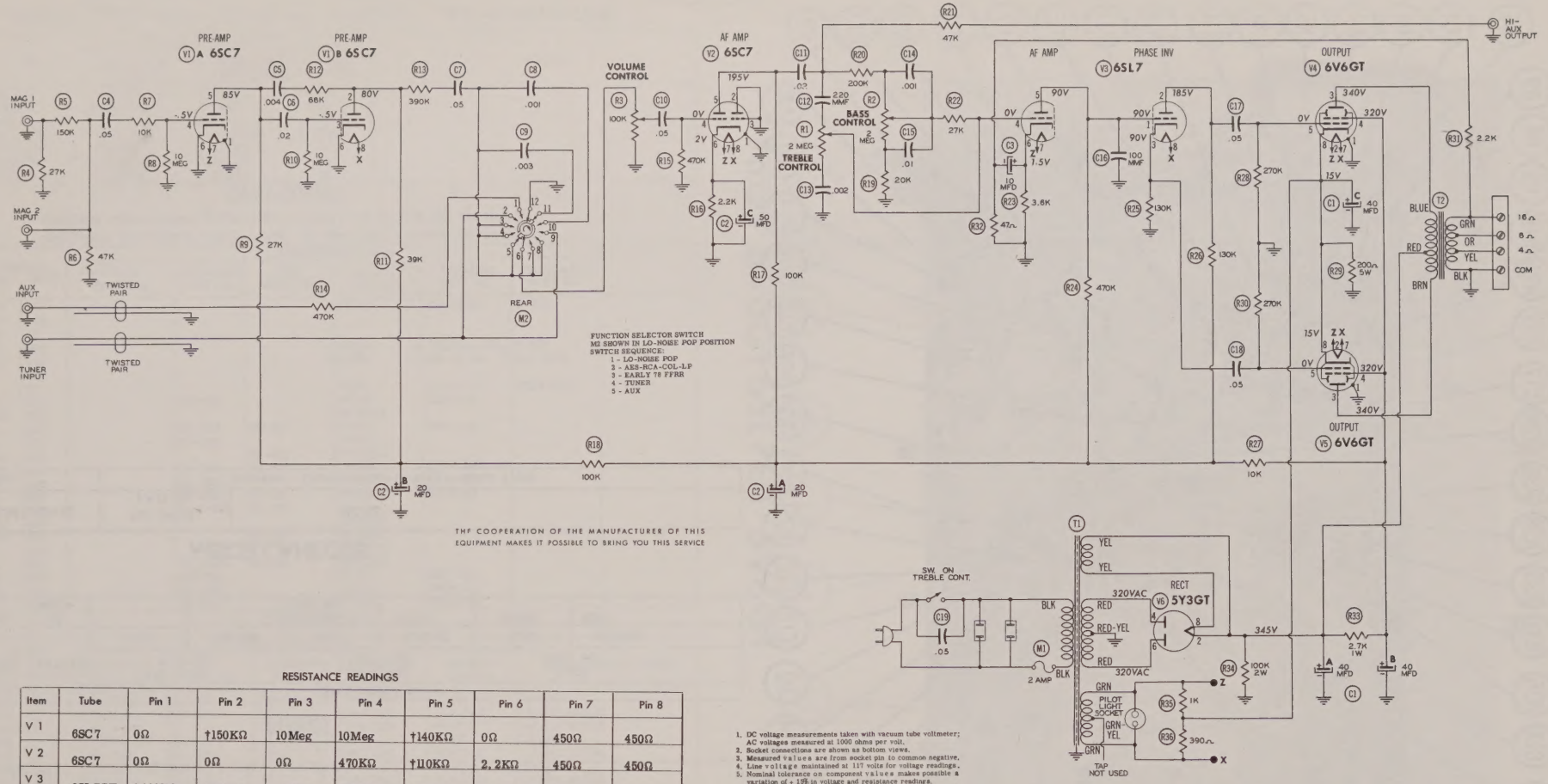

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SC7	0Ω	†150KΩ	10Meg	10Meg	†140KΩ	0Ω	450Ω	450Ω
V 2	6SC7	0Ω	0Ω	0Ω	470KΩ	†110KΩ	2.2KΩ	450Ω	450Ω
V 3	6SL7GT	†480KΩ	†140KΩ	130KΩ	470KΩ	†480KΩ	3.6KΩ	450Ω	450Ω
V 4	6V6GT	0Ω	450Ω	†200Ω	†2.7KΩ	270KΩ	NC	450Ω	200Ω
V 5	6V6GT	0Ω	450Ω	†200Ω	†2.7KΩ	270KΩ	TP	450Ω	200Ω
V 6	5Y3GT	NC	70KΩ	NC	110Ω	NC	110Ω	TP	70KΩ

† MEASURED FROM PIN 2 OF V6.
TP - TIE POINT
NC - NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

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CAPEHART MODEL 6TP45M (Ch. CA-161)

CAPEHART MODEL 6TP45M (Ch. CA-161)

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

CAPEHART MODEL 6TP45M (Ch. CA-161)

TRADE NAME	Capehart Model 6TP45M (Ch. CA-161)
MANUFACTURER	Capehart-Farnsworth Corp., Fort Wayne 1, Indiana
TYPE SET	AC Operated Phono Amplifier With 3 Speed Automatic Record Changer
TUBES (Four)	Types 12AX7 AF Amp-Phase Inverter, (2) 35L6GT Output, 35Z5GT Rectifier
POWER SUPPLY	105-125 Volts AC - 60 Cycles RATING .28 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON CAPEHART RECORD CHANGER MODEL 345B - SEE SIMILAR V-M MODEL 950 - PHOTOFACT SET #216 - FOLDER 11 OR RECORD CHANGER MANUAL CM-5

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PARTS LIST AND DESCRIPTIONS

CAPEHART
MODEL 6TP45M (Ch. CA-161)

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		CAPEHART PART No.	STANDARD REPLACEMENT		
V1	A F Amp. - Phase Inverter	12AX7	12AX7	9A	
V2	Output	35L6GT	35L6GT	7S	
V3	Output	35L6GT	35L6GT	7S	
V4	Rectifier	35Z5GT	35Z5GT	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT	CAPEHART PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	▬40	150	790090B-47			FP376. 9	TM-T40-150	T-110	
B	■40	150							
C	▲20	150							
C2	.0022	400	2248-2220	D6-2222	GP2L-222	PT4222	IMP4-D22	3304222	
C3	.047	400	2248-4730	DF-503		PT4147	IMP4-S47	3304147	
C4	.047	200	2246-4730	DF-503		PT4147	IMP2-S47	3302147	
C5	.1	400	2246-1040	DF-104		PT401	IMP4-P1	330401	
C6	.1	400	2246-1040	DF-104		PT401	IMP4-P1	330401	
C7	.022	200	2246-2230			PT4122	IMP2-S22	3302122	
C8	.1	200	2246-1040	DF-104		PT401	IMP2-P1	330201	
C9	.047	600	2248-4730	DF-503		PT6147	IMP6-S47	3306147	
C10	4	50							

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	CAPEHART PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	3. 3Meg	½	750266A-10			ABT-8517		Volume tapped at 300KΩ
B	Shaft		Not Req.			AK-4		Attach to R1A
R2	7500Ω	½	750266A-14					Tone

RESISTORS

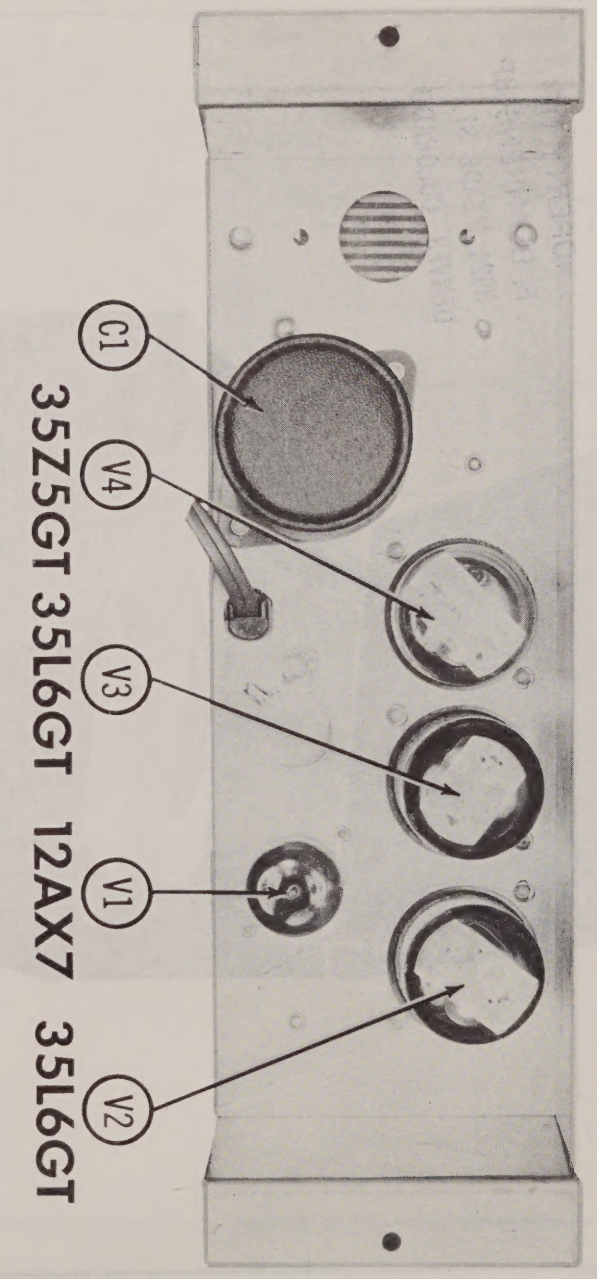
ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CAPEHART PART No.	IRC PART No.	
R3	220KΩ	½	3229-224	BTS-220K	
R4	100KΩ	½	3229-104	BTS-100K	
R5	270KΩ	½	3229-274	BTS-270K	
R6	100KΩ	½	3229-104	BTS-100K	
R7	4700Ω	½	3229-472	BTS-4700	
R8	220KΩ	½	3229-224	BTS-220K	
R9	220KΩ	½	3229-224	BTS-220K	
R10	10KΩ	½	3229-103	BTS-10K	
R11	600Ω	10	650833A-4		

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CAPEHART PART No.	IRC PART No.	
R12	220KΩ	½	3229-224	BTS-220K	
R13	220KΩ	½	3229-224	BTS-220K	
R14	82Ω	1	3232-820		
R15	220KΩ	½	3229-224	BTS-220K	
R16	56Ω	2	3235-560		
R17	10KΩ	½	3229-103	BTS-10K	
R18	10KΩ	½	3229-103	BTS-10K	
R19	100Ω	2	3235-101		

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	CAPEHART PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	
T1	3KΩCT	2. 2Ω	65087IA-1	A-3852	A-3018	S-53X	Z1007	22S87	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	CAPEHART PART No.	JENSEN PART No.	QUAM PART No.	
SP1	2½"	PM	5.4Ω	650868B-1			
SP2	6"	PM	3.3Ω	750548A-1		6A21LF	
SP3	6"	PM	3.3Ω	750548A-1		6A21LF	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	CAPEHART PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1		55-T	GDJ	47	0-1 or S-1 and 0-3	

ASTATIC AND ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENT SEE BELOW.

PHONO NEEDLE

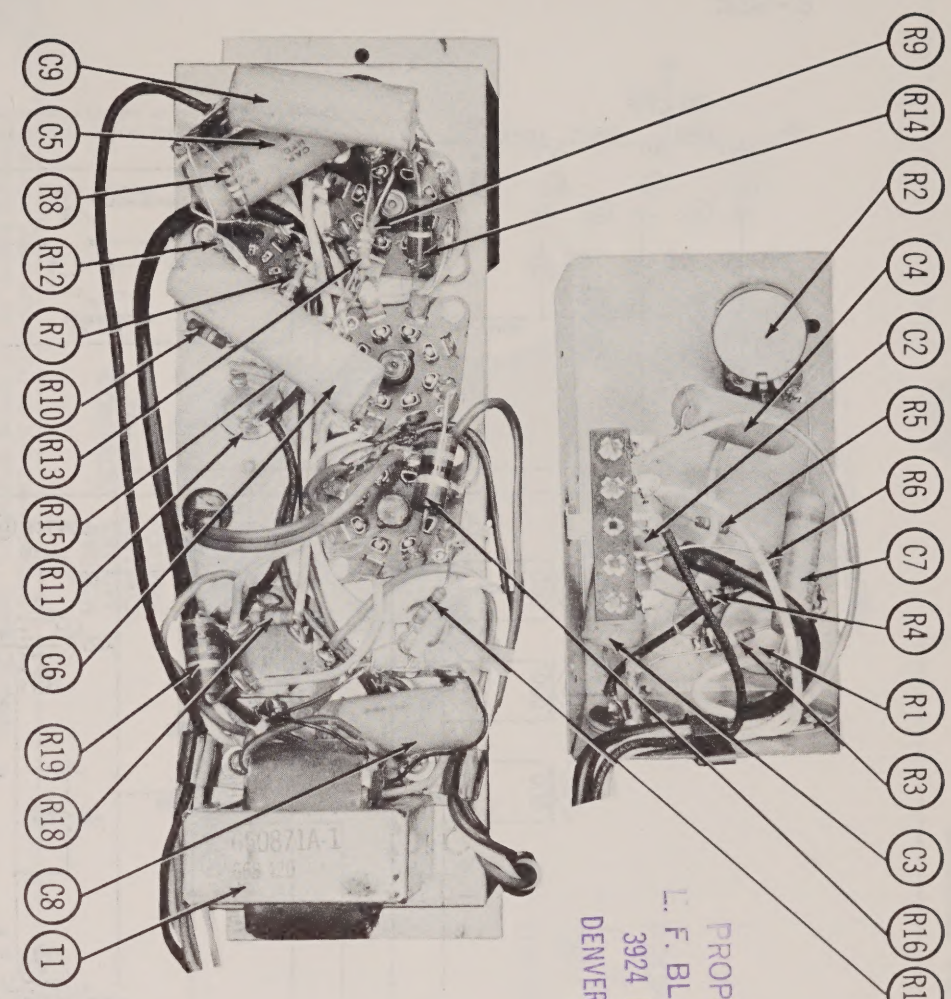
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA				REMARKS
	CAPEHART PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	
M2		†S-66 or ♦†S-66SD	†AC-434 or ♦†AC-434D1 or †♦AC-434D2 or ♦AC-434D	†W-75TPS or ♦†W-75DS or ♦W-75TPD	† Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	CAPEHART PART No.	NOTES
	Knobs	650854A-5	Control (2 used)
	Insignia	452188B-1	Capehart

CHASSIS—BOTTOM VIEW



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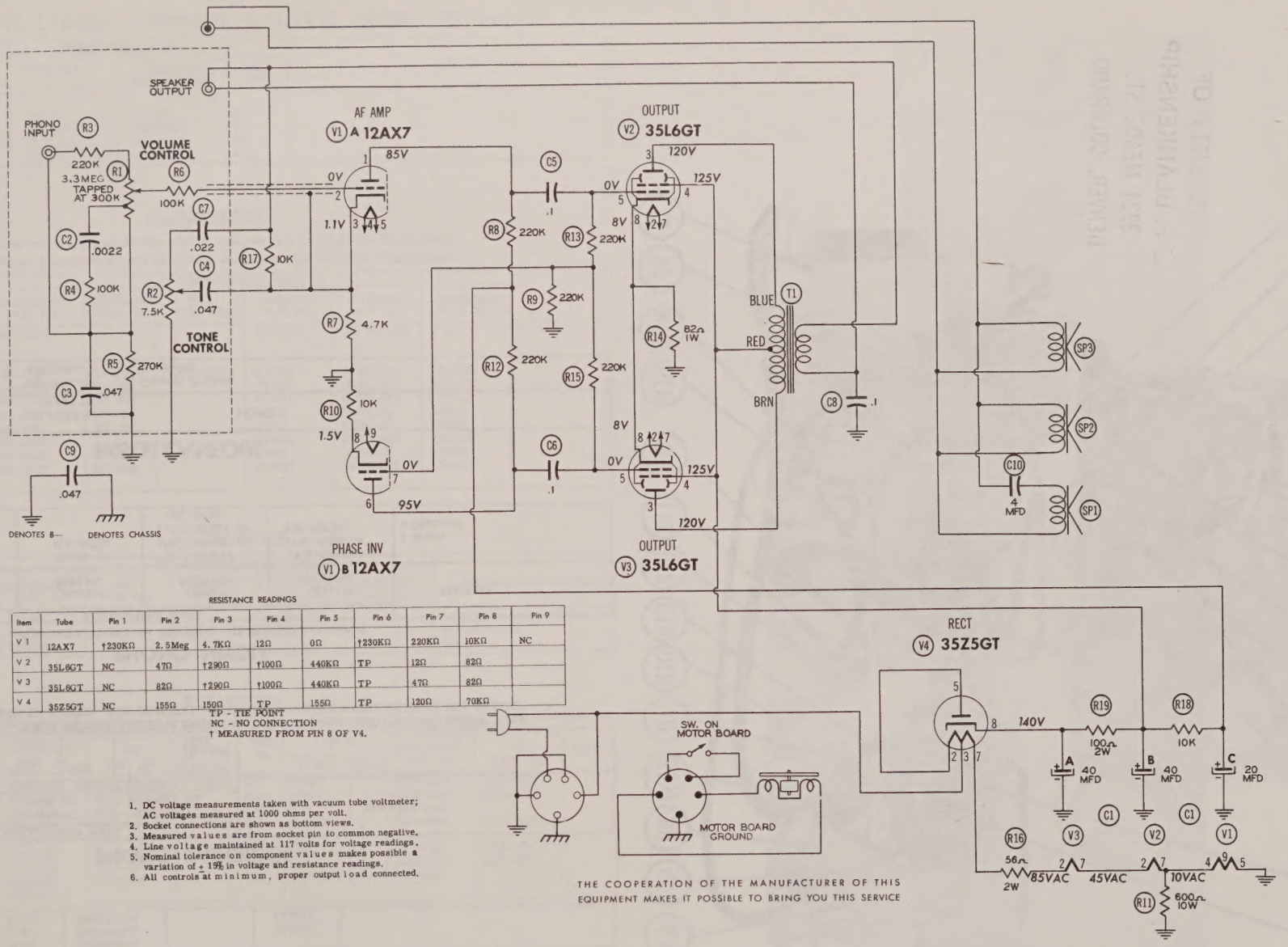

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AX7	†230KΩ	2.5Meg	4.7KΩ	12Ω	0Ω	†230KΩ	220KΩ	10KΩ	NC
V 2	35L6GT	NC	47Ω	†290Ω	†100Ω	440KΩ	TP	12Ω	82Ω	
V 3	35L6GT	NC	82Ω	†290Ω	†100Ω	440KΩ	TP	47Ω	82Ω	
V 4	35Z5GT	NC	155Ω	150Ω	TP	155Ω	TP	120Ω	70KΩ	

TP - TIE POINT
NC - NO CONNECTION
† MEASURED FROM PIN 8 OF V4.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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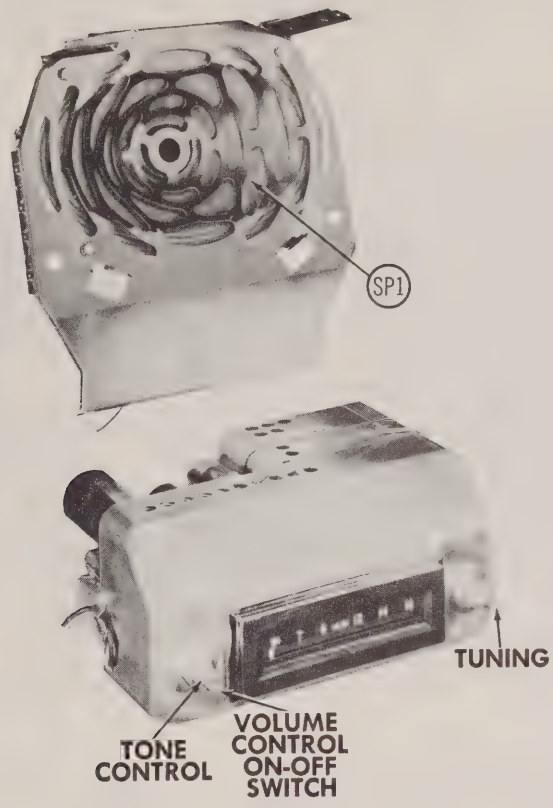
CHEVROLET
MODEL 987088



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CHEVROLET
MODEL 987088

TRADE NAME	Chevrolet Model 987088 (For All 1955 Chevrolet Cars)
SUPPLIER	Chevrolet Motors, Div. Of General Motors Corp., Detroit, Michigan
TYPE SET	Battery Operated Custom Built AM Automobile Superheterodyne Receiver
TUBES (Six)	Types 12BA6 RF Amp., 12BE6 Conv., 12BA6 IF Amp., 12AV6 Det-AVC-AF Amp., 12V6GT Output, 0Z4 Rectifier
POWER SUPPLY	12 Volt Storage Battery — RATING 2.8 Amp. @ 12.6 Volts DC
TUNING RANGE—BROADCAST	540KC - 1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Set the tone control to treble position.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1MFD	High side to pin 7 (grid) of 12BE6 (V2). Low side to chassis.	262KC (400~ Mod)	Extreme high frequency end of dial.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output.
2	82MMF	Thru dummy to antenna receptacle. Low side to chassis.	1615KC	"	"	A5, A6, A7	Preset A8 (Osc. Core) so that the rear of core is 1 25/32" from mounting end of coil form. Adjust A5, A6 and A7 in order given for maximum output.
3	"	"	1000KC	Tune to 1000KC signal.	"	A9, A10	Adjust for maximum output.
4	"	"	1615KC	Extreme high frequency end of dial.	"	A6, A7	"
5	"	"	900KC	Tune to 900KC signal.	"		Adjust pointer on dial cord so that the pointer is on 900KC mark of the dial.

With receiver installed in car and antenna plugged in, tune to a weak signal between 600KC and 1000KC. Adjust A7 for maximum volume.

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PARTS LIST AND DESCRIPTIONS

CHEVROLET
MODEL 987088

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: CHEVROLET PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amp.	12BA6	12BA6	7BK	
V2	Converter	12BE6	12BE6	7CH	
V3	IF Amp.	12BA6	12BA6	7BK	
V4	Det-AF Amp.	12AV6	12AV6	7BT	
V5	Audio Output	12V6GT	12V6GT	7S	
V6	Rectifier	0Z4	0Z4	4R	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: CHEVROLET PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	■20	400	6309			FP234	TM-D20-450	D-215	
B	▲20	400							
C2	.05	200	6512	DF-503		PT415	IMP2-S5	330215	
C3	.05	400	6512	DF-503		PT415	IMP4-S5	330415	
C4	10	500	G-100	D6-100	GP1K-100	MC215		K-1410	
C5	180	500	7257424	TCZ-180	NP0-334-181			KR-1318	
C6	.002	400	6582	D6-202	GP2-333-202	PT622	IMP6-D2	330622	
C7	.01	600	6533	D6-103	GP2-333-103	PT611	IMP6-S1	330611	
C8	.05	400	6512	DF-503		PT415	IMP4-S5	330415	
C9	.001	600	6527	D6-102	GP2L-102	PT621	IMP6-D1	330621	
C10	.006	800	H-602			PT1626	CT16-D6	2110-006	
C11	.007	1600	H-702			PT1627	CT16-D5		
C12	.47	100	7257906			RF480	85LPT2-P5		
C13	.5	100	6592			RF480	85LPT2-P5	330205	

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: CHEVROLET PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2Meg	½	7265220			F1-68	UF26A †	Tone - Panel
B	300KΩ	½				R2-35	UR354A †	Volume - Rear
C	Bushing					AK-27	EB-214 †	Attach to R1A
C	Switch					KB-7	US-26 †	Attach to R1B

† Universal replacement (Mallory exact duplicate part no. UE-1770S)

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: CHEVROLET PART No.	IRC PART No.	NOTES
R2	2.2Meg	½	1239	BTS-2.2Meg	
R3	150Ω	½	1115	BTS-150	
R4	15KΩ	2	1277	BTB-15K	
R5	15KΩ	1	1253	BTA-15K	
R6	330KΩ	½	1229	BTS-330K	
R7	22KΩ	½	1215	BTS-22K	
R8	150Ω	½	1115	BTS-150	
R9	47KΩ	½	1219	BTS-47K	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: CHEVROLET PART No.	IRC PART No.	NOTES
R10	1Meg	½	1235	BTS-1Meg	
R11	6.8Meg	½	1245	BTS-6.8Meg	
R12	220KΩ	½	1227	BTS-220K	
R13	220KΩ	½	1227	BTS-220K	
R14	330Ω	1	1156	BTA-330	
R15	1800Ω	2		BTB-1800	Note 1
R16	15KΩ	1	1253	BTA-15K	

Note 1: When replacing, manufacturer recommends replacing with 2700Ω 2 watt and 5600Ω 1 watt resistors in parallel.

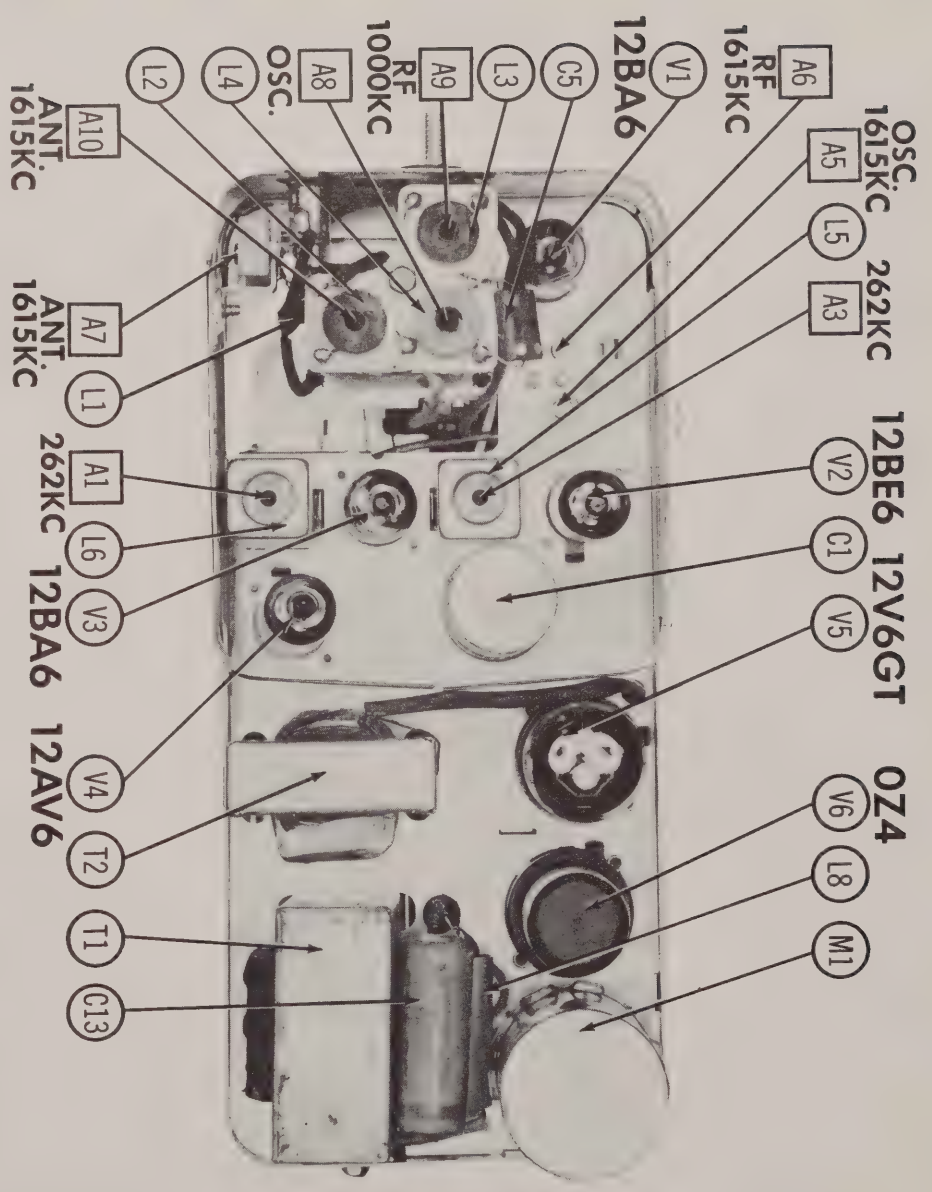
TRANSFORMER (VIBRATOR)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: CHEVROLET PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.
T1	12VCT @ 1.8A	470VCT .053ADC			7265604					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: CHEVROLET PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	NOTES
T2	6KΩ	3.3Ω	6062	A-3823①	A-3019 ①	S-5Z ①	Z1002 ①	26S49 ①	① Fabricate mounting.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	CHEVROLET PART No.	JENSEN PART No.	QUAM PART No.	
SP1	6" X 9"	PM	3.3Ω	6112	ST-810 Mod. P69-V	69A3	

COILS (RF-IF)

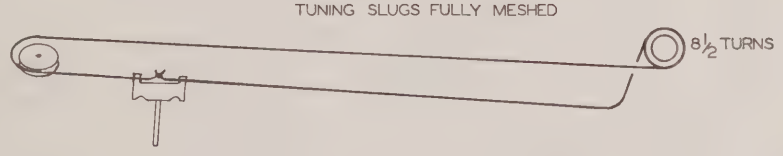
ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	CHEVROLET PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Loading Coil	.6Ω		7255738	19-1004		4610	7 Microhenries
L2	Ant. Coil	10Ω		7258914				
L3	RF Coil	15Ω		7258914				
L4	Osc. Coil	1Ω	4.3Ω	7258911				
L5	Input IF	32Ω	32Ω	1218725	16-6752	BC-350	12-H1	
L6	Output IF	32Ω	32Ω	1218726	16-6754	BC-354	12-H6	
L7	Fil. Choke	0Ω		1218746				1.6 Microhenries
L8	Vib. Hash Choke	0Ω		7263864				43 Microhenries

VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	REPLACEMENT DATA				NOTES
				CHEVROLET PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	
M1	Interrupter	12V	115∿	8550	6330	G874/G883	6330	

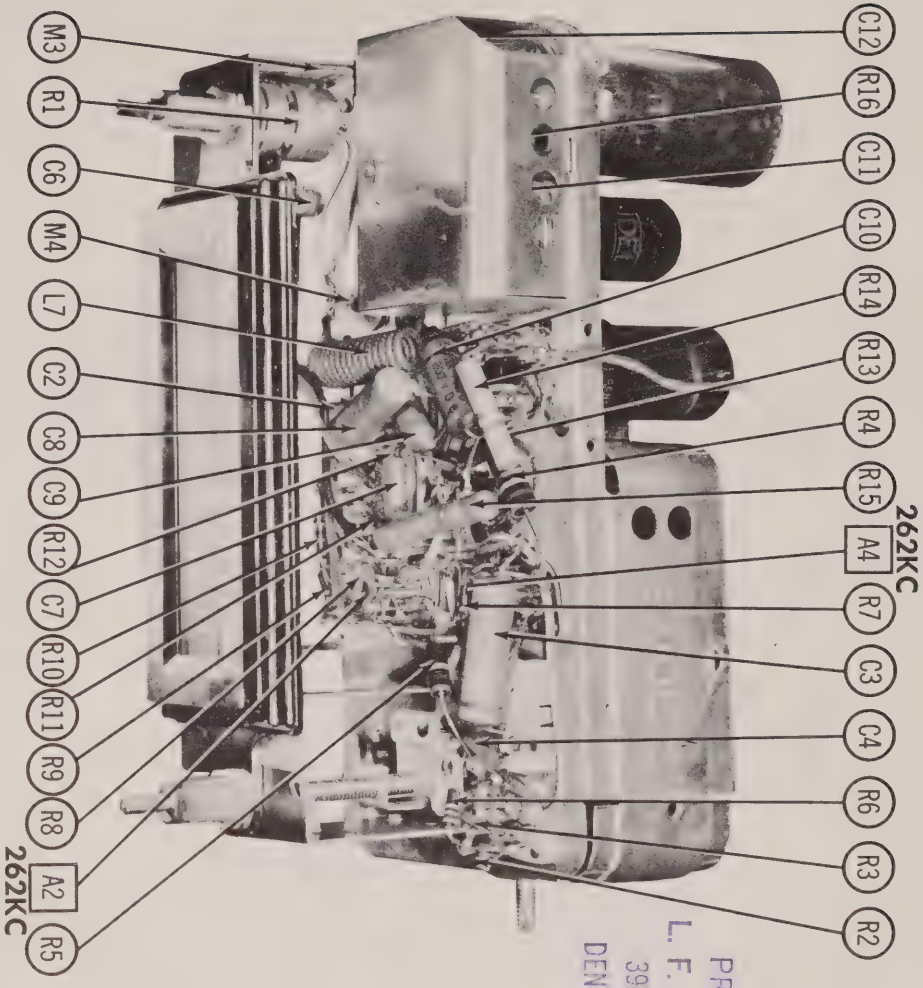
MISCELLANEOUS

ITEM No.	PART NAME	CHEVROLET PART No.	NOTES
M2	Dial Light		#57, Bayonet
M3	Spark Plate	1220682	
M4	Spark Plate	1217848	
A5, A6	Trimmer Cap.	7263918	Dual Trimmer (4 sections) Osc. & RF Trimmer
A7	Trimmer Cap.	7265202	Ant. Trimmer
	Knob	1990777	On-Off-Volume & Tuning
	Knob	7265132	Tone
	Knob	7265149	Dummy
	Dial Pointer Ass'y.	7265195	
	Core Bar Ass'y.	7265194	
	Escutcheon Ass'y.	7265208	Includes Dial Glass



DIAL CORD STRINGING

CHASSIS—BOTTOM VIEW



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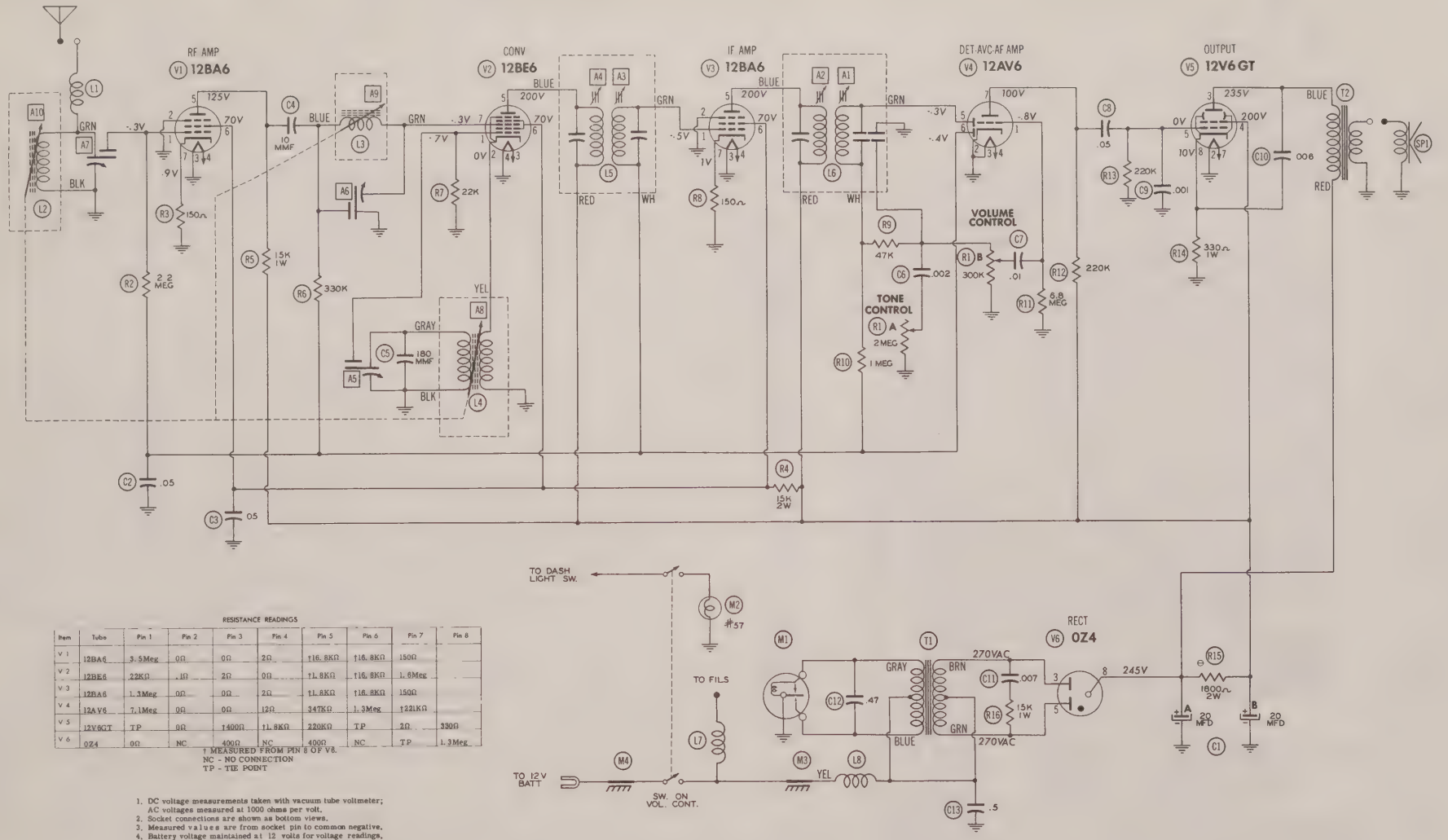
CHEVROLET MODEL 987088



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12BA6	3.5Meg	0Ω	0Ω	2Ω	†16.8KΩ	†16.8KΩ	150Ω	
V 2	12BE6	22KΩ	.1Ω	2Ω	0Ω	†1.8KΩ	†16.8KΩ	1.6Meg	
V 3	12BA6	1.3Meg	0Ω	0Ω	2Ω	†1.8KΩ	†16.8KΩ	150Ω	
V 4	12AV6	7.1Meg	0Ω	0Ω	12Ω	347KΩ	1.3Meg	†221KΩ	
V 5	12V6GT	TP	0Ω	†400Ω	†1.8KΩ	220KΩ	TP	2Ω	330Ω
V 6	0Z4	0Ω	NC	400Ω	NC	400Ω	NC	TP	1.3Meg

† MEASURED FROM PIN 8 OF V8.
NC - NO CONNECTION
TP - TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 12 volts for voltage readings.
5. Nominal tolerance on components values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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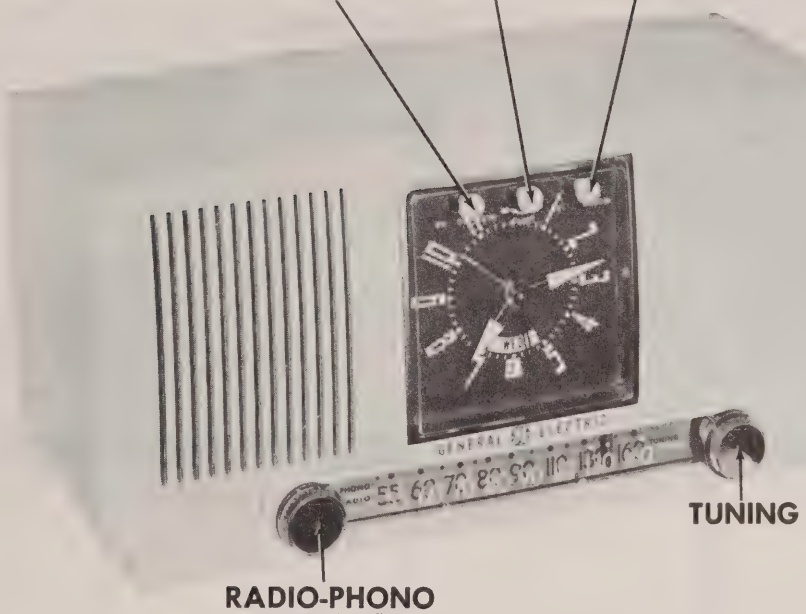

GENERAL ELECTRIC
MODELS 577, 578

TRADE NAME	General Electric Models 577, 578
MANUFACTURER	General Electric Co., Electronics Dept., Electronics Park, Syracuse, N.Y.
TYPE SET	AC Operated AM Superheterodyne Receiver With Electric Clock
TUBES (Five)	Types 12BE6 Conv., 12BA6 IF Amp., 12AV6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-120 Volts AC-60 Cycles — RATING .25 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 1 (grid) of 12BA6 (V2). Low side to chassis.	455KC (400\Mod)	Tuning gang fully open.	Across voice coil	A1, A2	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	"	High side to pin 7 (grid) of 12BE6 (V1). Low side to chassis.	"	"	"	A3, A4	"
3.		Loop	1620KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.		"	1500KC	Tune to 1500KC signal	"	A6	Adjust for maximum output while rocking tuning gang.

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PARTS LIST AND DESCRIPTIONS

GENERAL ELECTRIC MODEL 577

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: General Electric PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amplifier	12BA6	12BA6	7BK	
V3	Det.-AVC-AF Amp	12AV6	12AV6	7BT	
V4	Audio Output	50C5	50C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: General Electric PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	50	150	RCE-149			TCD49	TDL-D50-150	FMD-1550	
B	50	150							
C2	47		RCW-2075						
C3	.05	200	UCC-045	DF-503		PT415	IMP2-S5	330215	
C4A	400			D6-401	GP2K-401	UC-534		K-1340	
B	2000		RCW-3048	DD-202	801-002	DC-522		C-1220	
C	220			D6-221	GP2K-221	UC-5322		K-1322	
D	5000			DD-502	811-005	DC-525		C-1250	
C5	.022	600	RCN-050	DF-203	817-02	PT6122	IMP6-S22	3306122	
C6	.047	600	RCN-053	DF-502		PT6147	IMP6-S47	3306147	
C7	.05	200	UCC-045	DF-502		PT415	IMP2-S5	330215	

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: General Electric PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	1Meg	½	RRC-300					Radio, phono volume & switch tapped @ 500KΩ

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: General Electric PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R2	22KΩ	½	URD-081	BTS-22K	
R3	100Ω	½		BTS-100	
R4	68Ω	½	URD-021	BTS-68	
R5	2.2Meg	½	URD-129	BTS-2.2Meg	
R6	1.5Meg	½	URD-125	BTS-1.5Meg	
R7	33KΩ	½	URD-085	BTS-33K	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: General Electric PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R8	6.8Meg	½	URD-141	BTS-6.8Meg	
R9	470KΩ	½	URD-113	BTS-470K	
R10	470KΩ	½	URD-113	BTS-470K	
R11	150Ω	½	URD-029	BTS-150	
R12	1500Ω	2	URF-053	BTB-1500	
R13	18Ω	¼	URD-007	BTS-18	

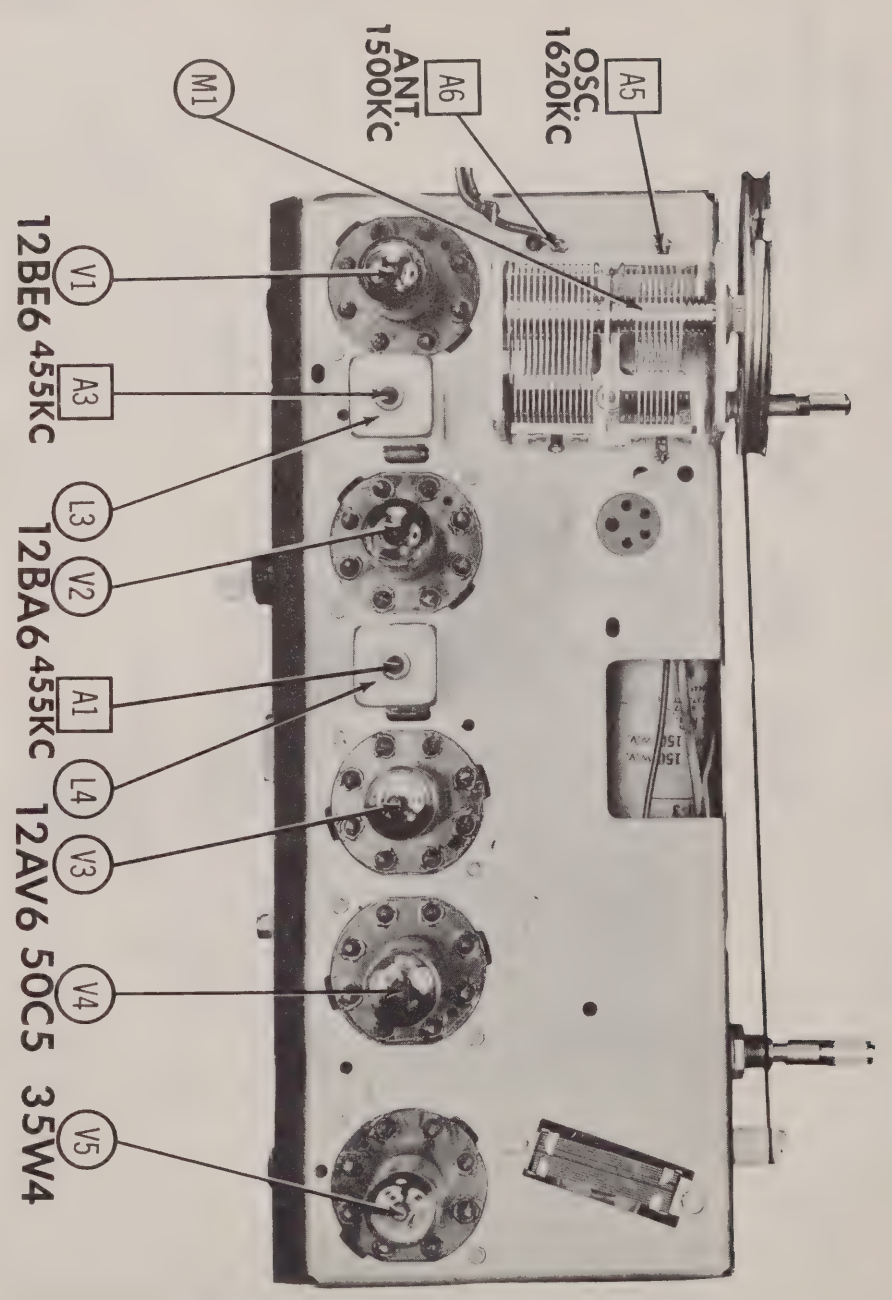
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: General Electric PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	NOTES
T1	2.5KΩ	3.5Ω	RTO-138	A-3336 ①	A-3031 ①		Z1102 ①	24S50A①	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: General Electric PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	4"	PM	3.5Ω	S-403D-7	ST-113 Mod. P4-X	4A07	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

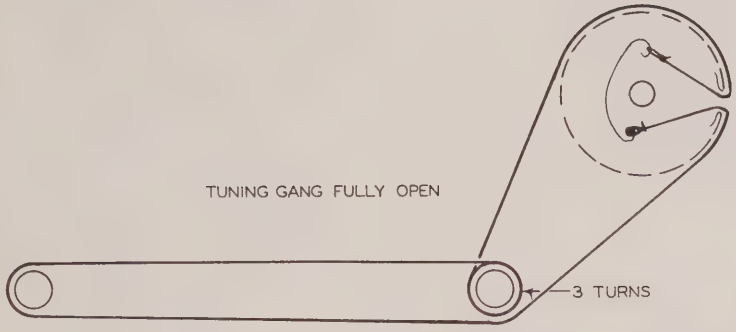
COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	General Electric PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Ant.	3.1Ω		RAB-252				Includes cabinet back
L2	Osc. Coil	.6Ω	6.5Ω	RLC-119	14-1074 *		71-OSC ■	
L3	Input IF	14Ω	14Ω	RTL-135	16-6758	BC-352	12-C1	
L4	Output IF	13Ω	13Ω	RTL-135	16-6758	BC-353	12-C2	

* Leads sufficient mounting support.
■ Drill mounting hole.

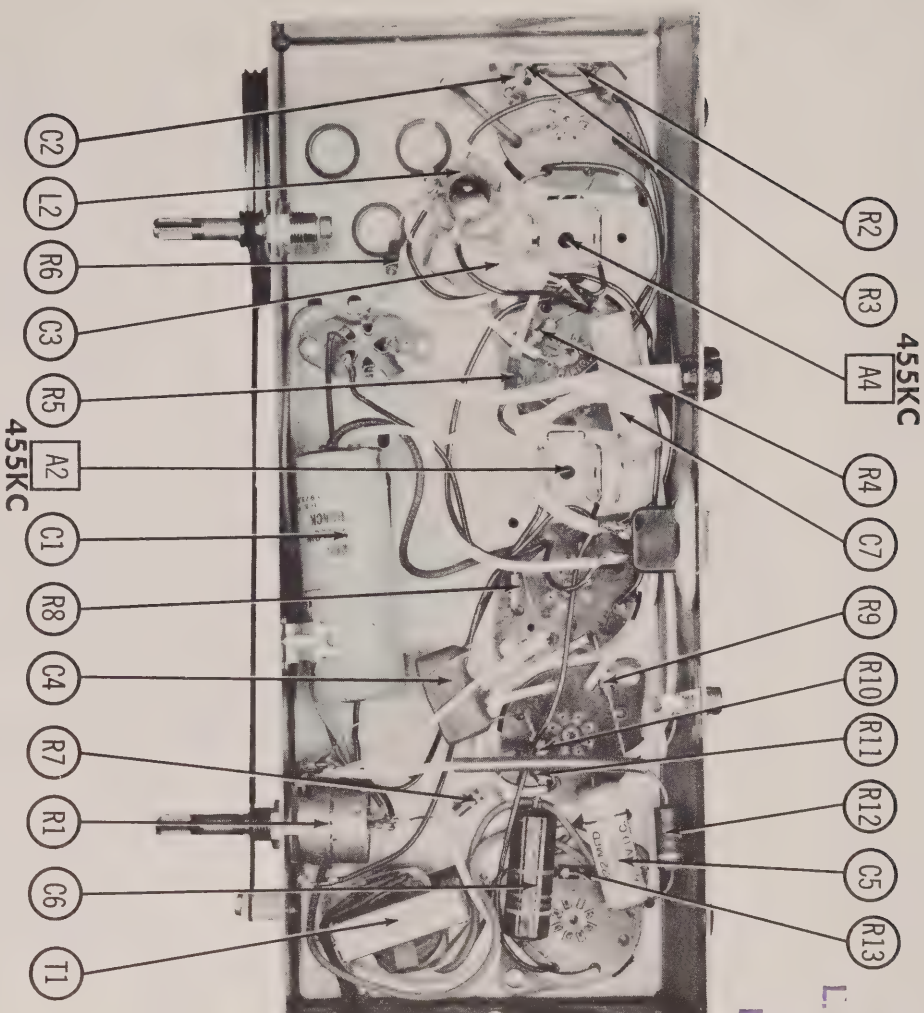
MISCELLANEOUS

ITEM No.	PART NAME	General Electric PART No.	NOTES
M1	Tuning Cap.	RCT-063	2 Gang (24-470MMF, 22-150MMF)
M2	Clock Assy.	RZC-042	Model 577 - Less bezel and crystal
	Clock Assy.	RZC-043	Model 578 - Less bezel and crystal
	Cabinet	RAU-365	Model 577
	Cabinet	RAU-367	Model 578
	Knob	RDK-425	Volume or tuning
	Knob	RZK-009	Clock - Alarm, sleep or switch set - Model 578
	Knob	RZK-026	Clock - Alarm, sleep or switch set - Model 577
	Crystal	RZW-013	Clock - Model 577
	Crystal	RZW-014	Clock - Model 578
	Dial Pointer	RDP-074	
	Dial Scale	RDS-127	



DIAL CORD STRINGING

CHASSIS—BOTTOM VIEW



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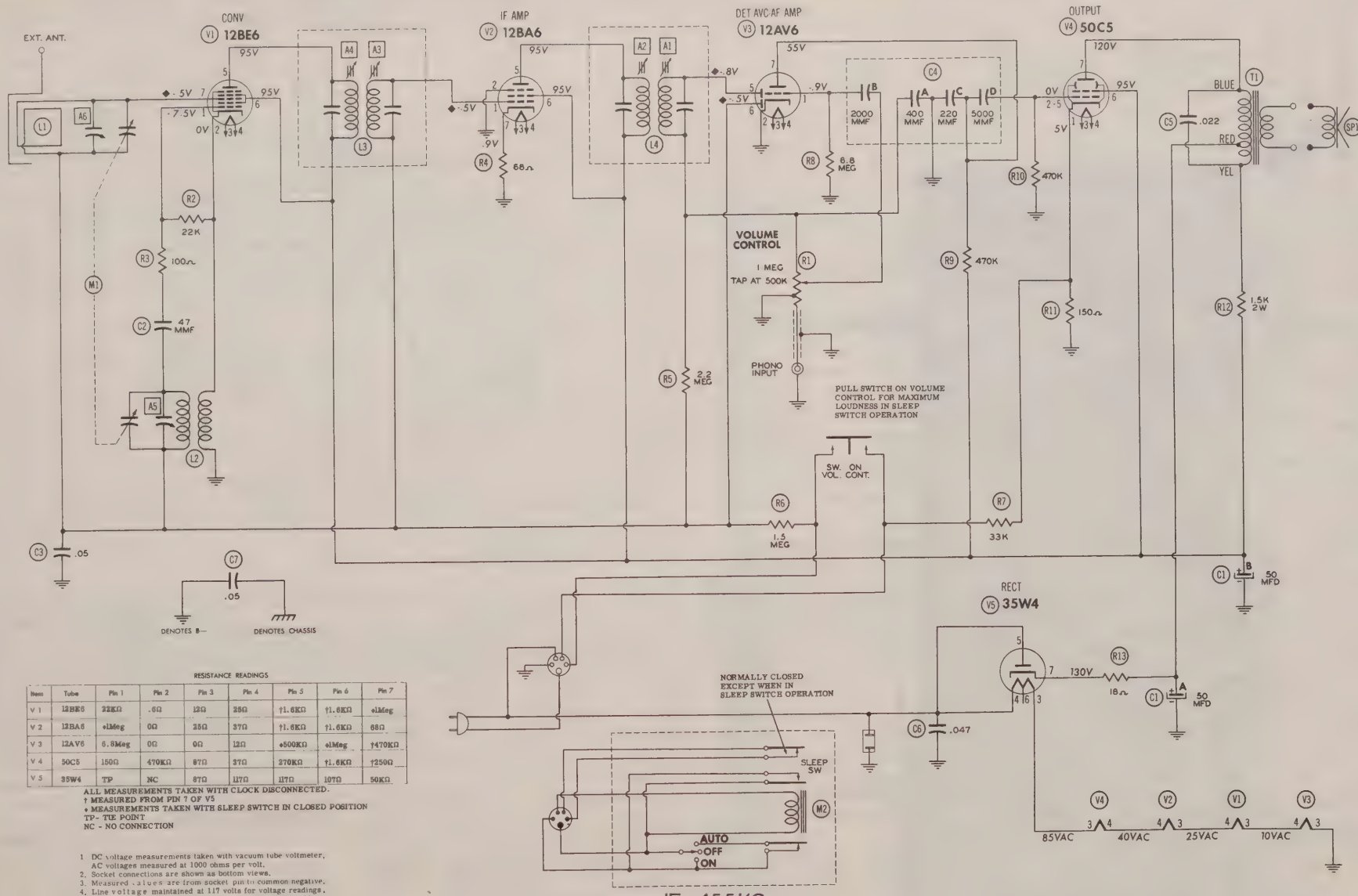

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	.6Ω	12Ω	25Ω	†1.6KΩ	†1.6KΩ	◆1Meg
V 2	12BA6	◆1Meg	0Ω	25Ω	37Ω	†1.6KΩ	†1.6KΩ	68Ω
V 3	12AV6	6.8Meg	0Ω	0Ω	12Ω	◆500KΩ	◆1Meg	†470KΩ
V 4	50C5	150Ω	470KΩ	87Ω	37Ω	270KΩ	†1.6KΩ	†250Ω
V 5	35W4	TP	NC	87Ω	117Ω	117Ω	107Ω	50KΩ

ALL MEASUREMENTS TAKEN WITH CLOCK DISCONNECTED.
† MEASURED FROM PIN 7 OF V5
◆ MEASUREMENTS TAKEN WITH SLEEP SWITCH IN CLOSED POSITION
TP- TIE POINT
NC - NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter, AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

IF= 455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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PHOTOFACT* Folder

MAGNAVOX
CHASSIS CMUA435AA, CMUA436AA,
CTA435AA, CTA436AA

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CHASISS CMUA435AA

MAGNAVOX
CHASSIS CMUA435AA, CMUA436AA,
CTA435AA, CTA436AA

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DATE 5–55 SET 278 FOLDER 5

PHOTOFACT* Folder
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MAGNAVOX
CHASSIS CMUA435AA, CMUA436AA, CTA435AA, CTA436AA

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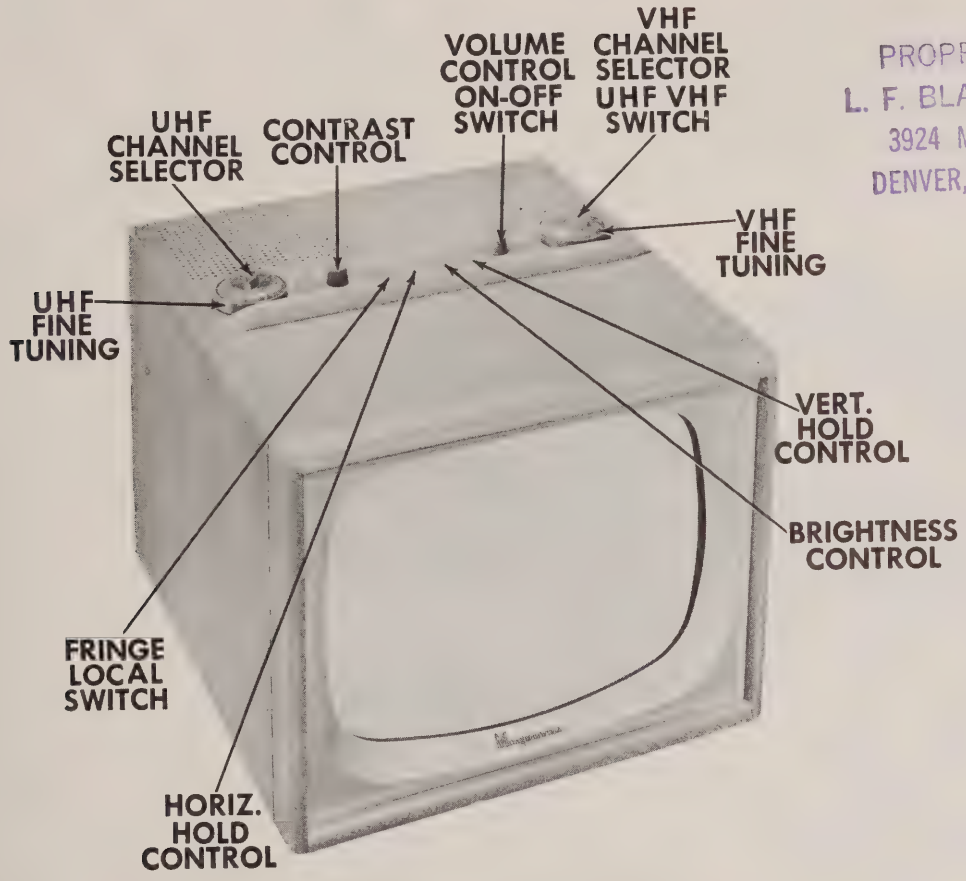

MAGNAVOX CHASSIS CMUA435AA

TRADE NAME	Magnavox Chassis CMUA435AA, CMUA436AA, CTA435AA, CTA436AA (250 Series)
MANUFACTURER	Magnavox Co., 2131 Bueter Road., Ft. Wayne 4, Ind.
TUBES	Twenty-one
POWER SUPPLY	110-120 Volts AC - 60 Cycle RATING 1.6 Amp. @ 117 Volts AC
TUNING RANGE	Channel 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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MAGNAVOX
CHASSIS CMUA435AA, CMUA436AA,
CTA435AA, CTA436AA

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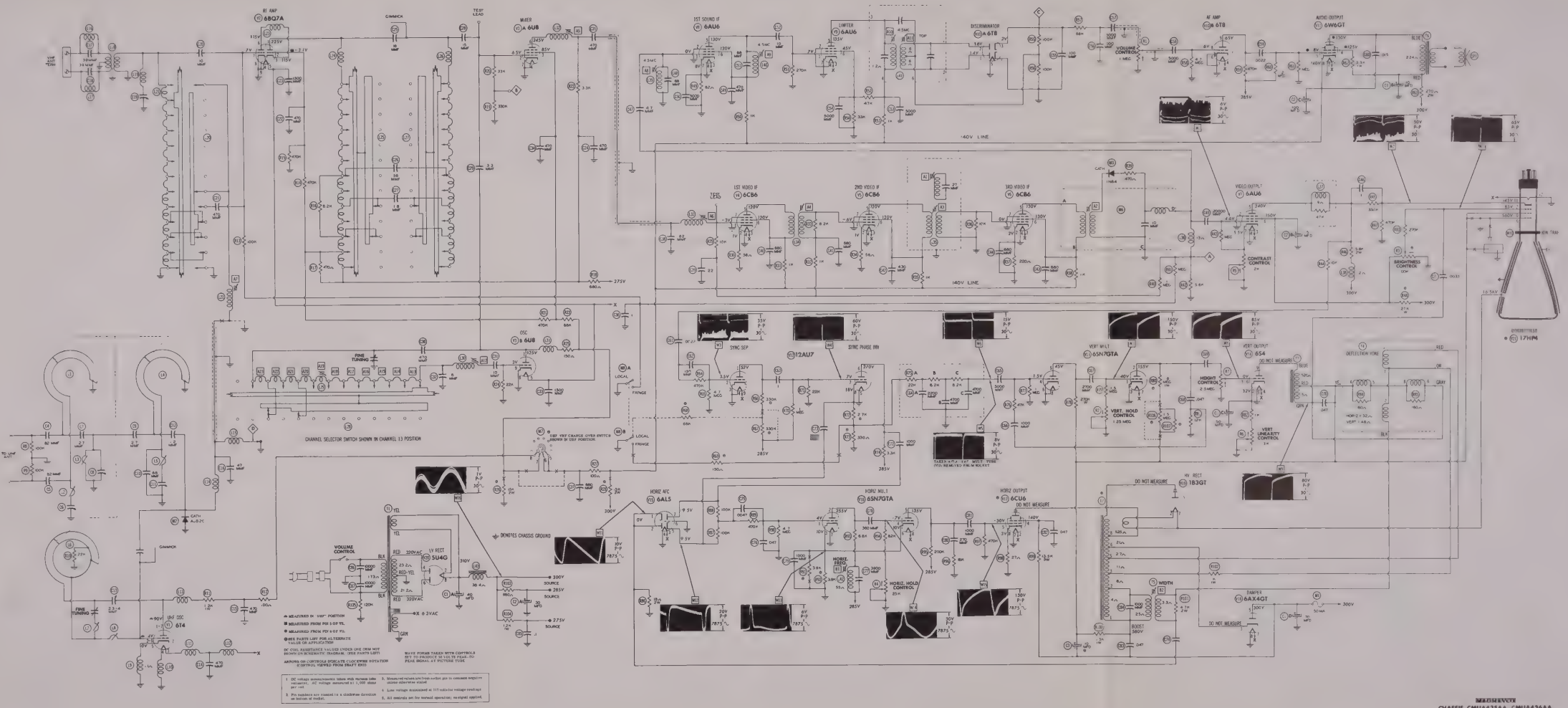

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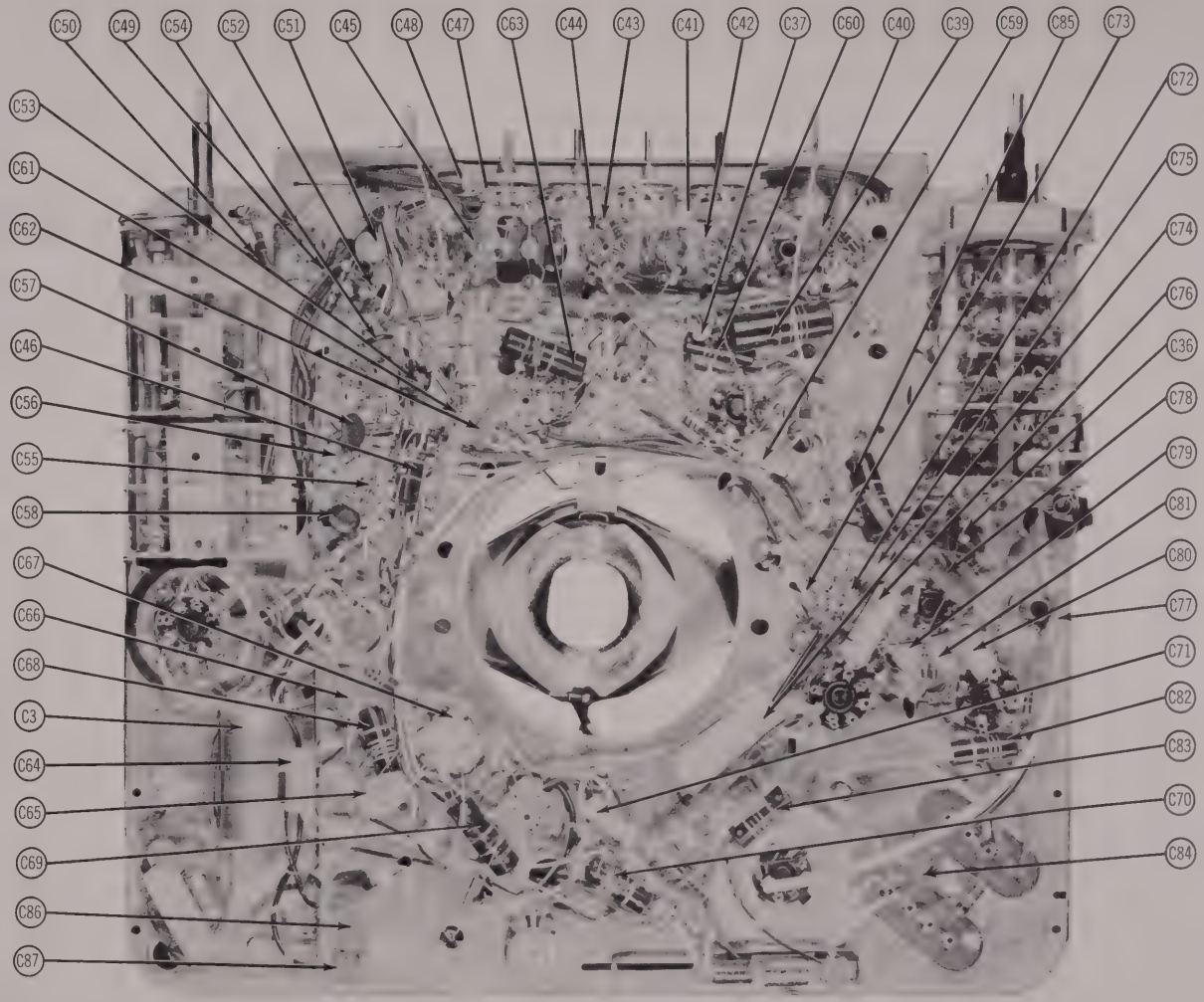
CHASSIS TOP VIEW

MAGNAVOX CHASSIS CMUA435AA,
CMUA436AA, CTA435AA, CTA436AA



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CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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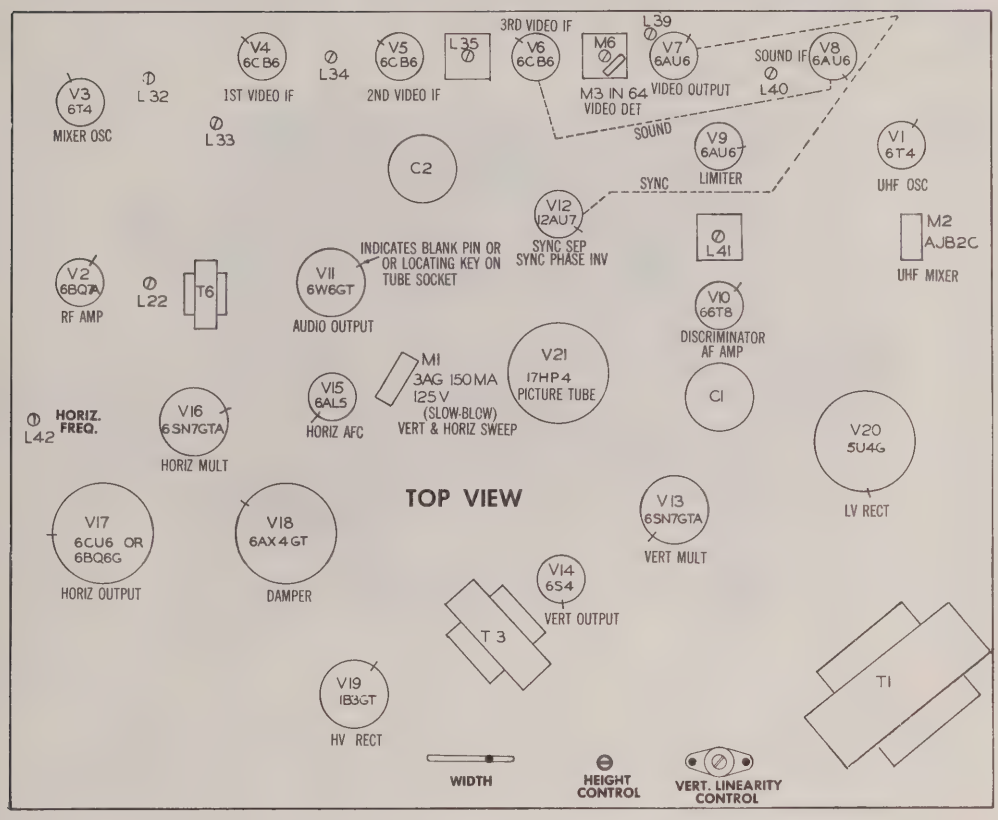
TUBE PLACEMENT CHART



MAGNAVOX
CHASSIS CMUA435AA, CMUA436AA, CTA435AA, CTA436AA

TUBE FAILURE CHECK CHART

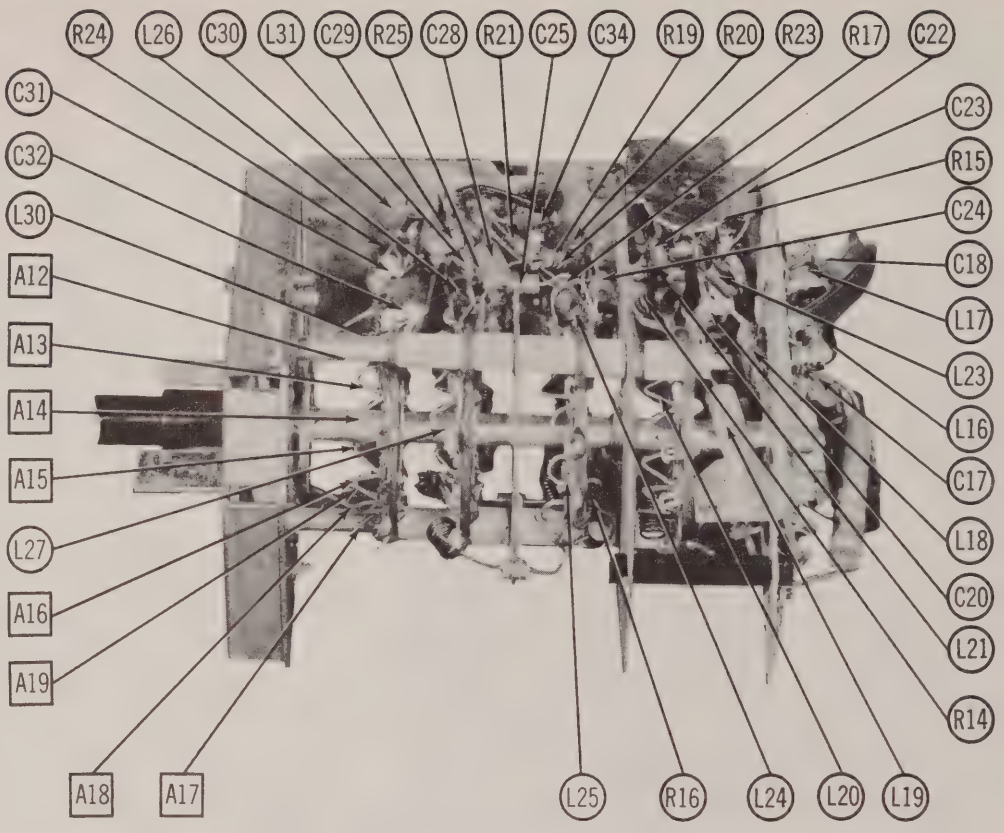
The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V20**

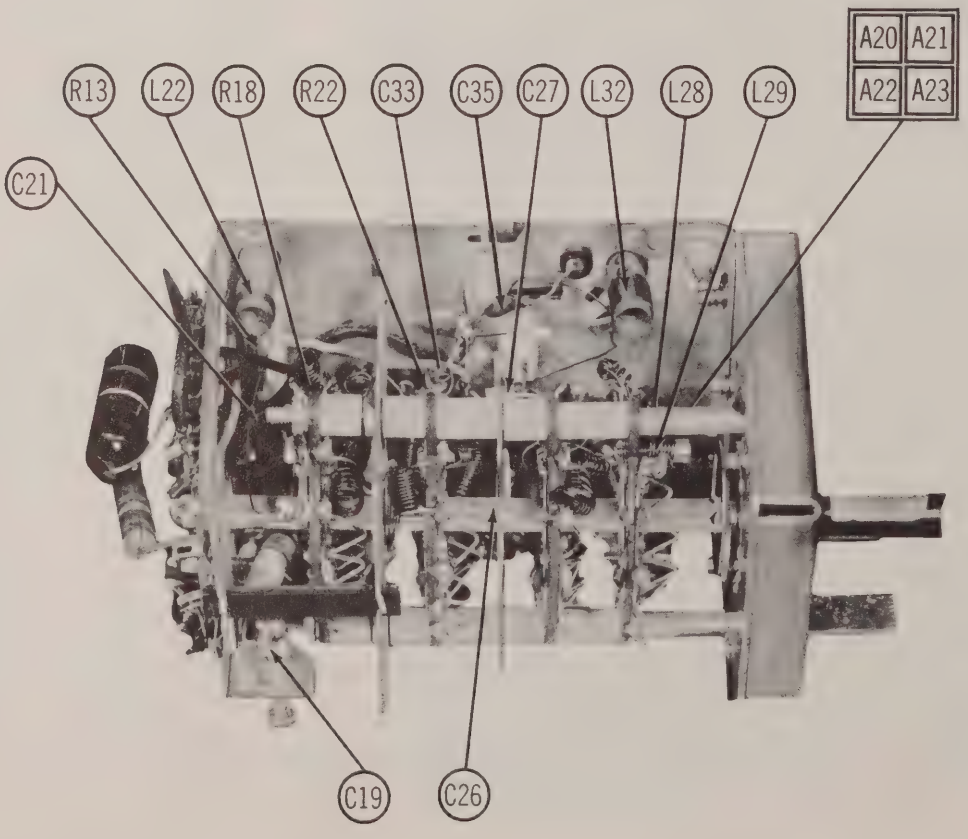
LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V6**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V7, V21**
Has pic, no sound - **V8, V9, V10, V11**

SYNC FAILURE
No vert. sync - **V12, V13**
No horiz. sync - **V12, V15, V16**
No vert. or horiz. sync - **V12**

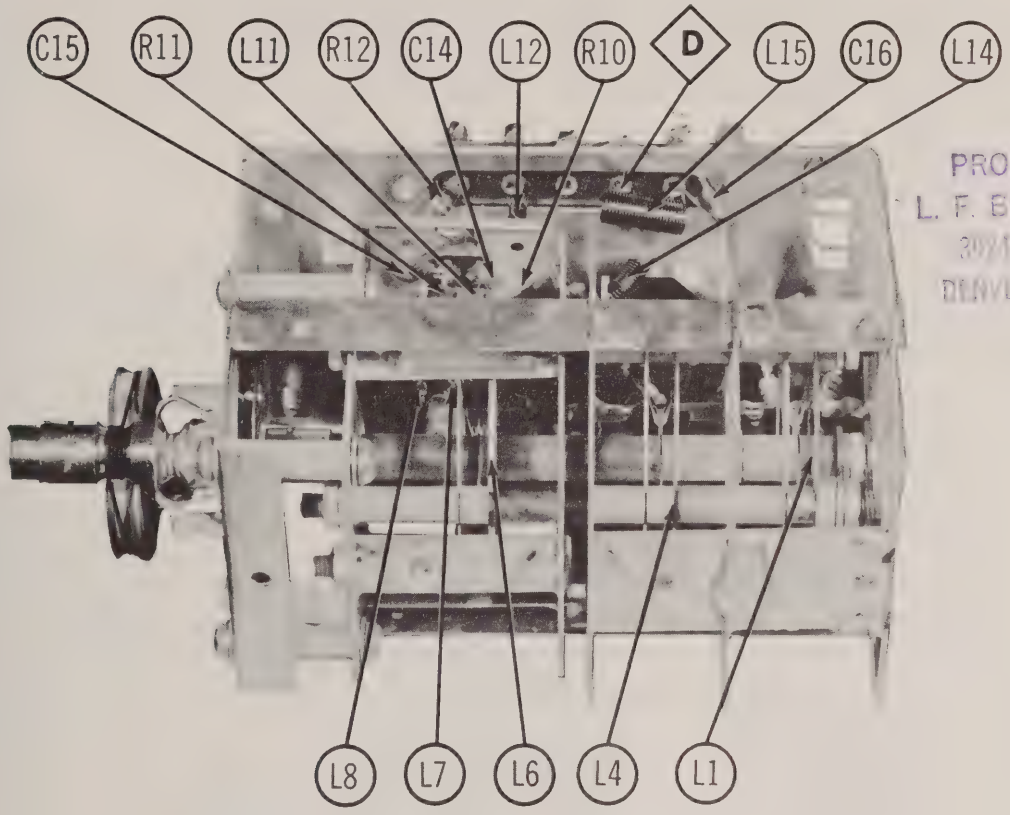
SWEEP FAILURE
No raster, has sound - **V16, V17, V18, V19, V21, Fuse (M1)**
No vertical deflection - **V13, V14**
Poor vert. linearity or foldover - **V13, V14**
Poor horiz. linearity or foldover - **V16, V17, V18**
Narrow picture - **V16, V17, V18, V19, V20**
Vert. off freq. - **V12, V13**
Horiz. off freq. - **V12, V15, V16**



VHF TUNER-RIGHT SIDE



VHF TUNER-LEFT SIDE



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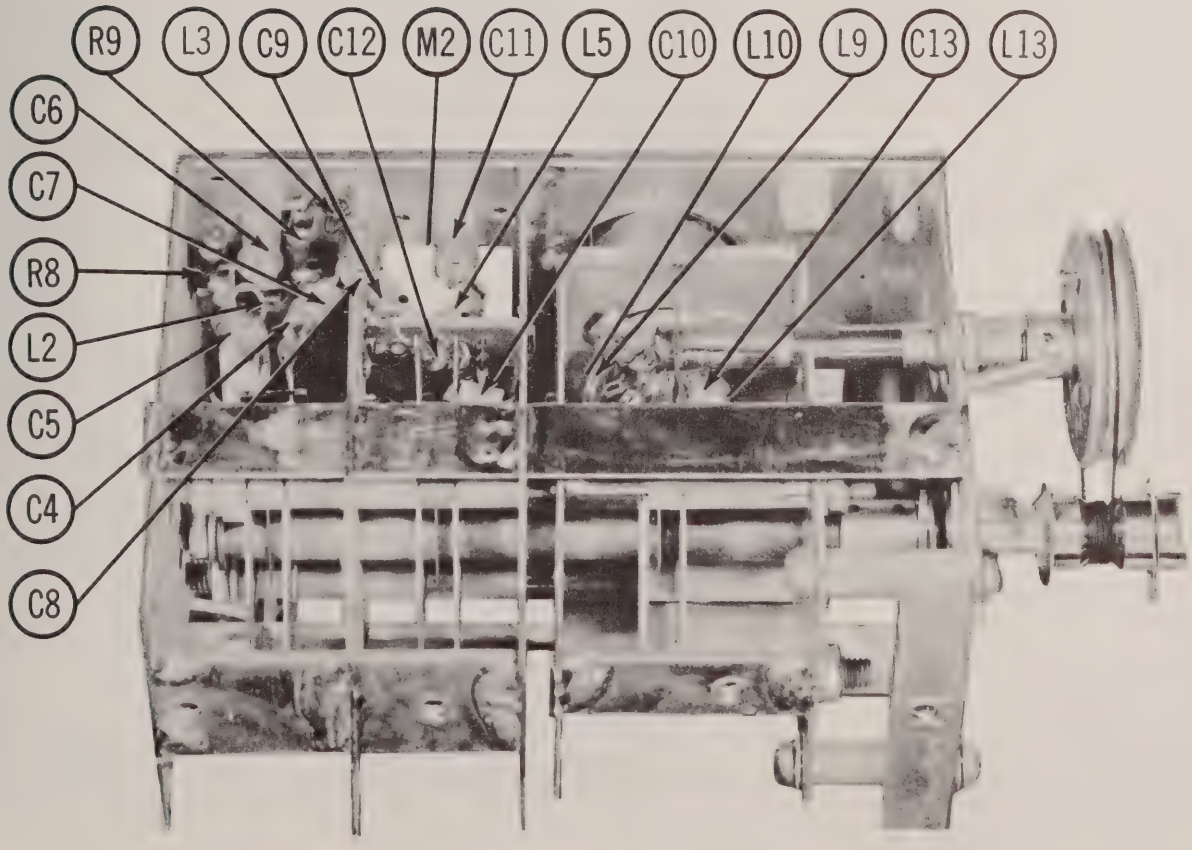
UHF TUNER-RIGHT SIDE

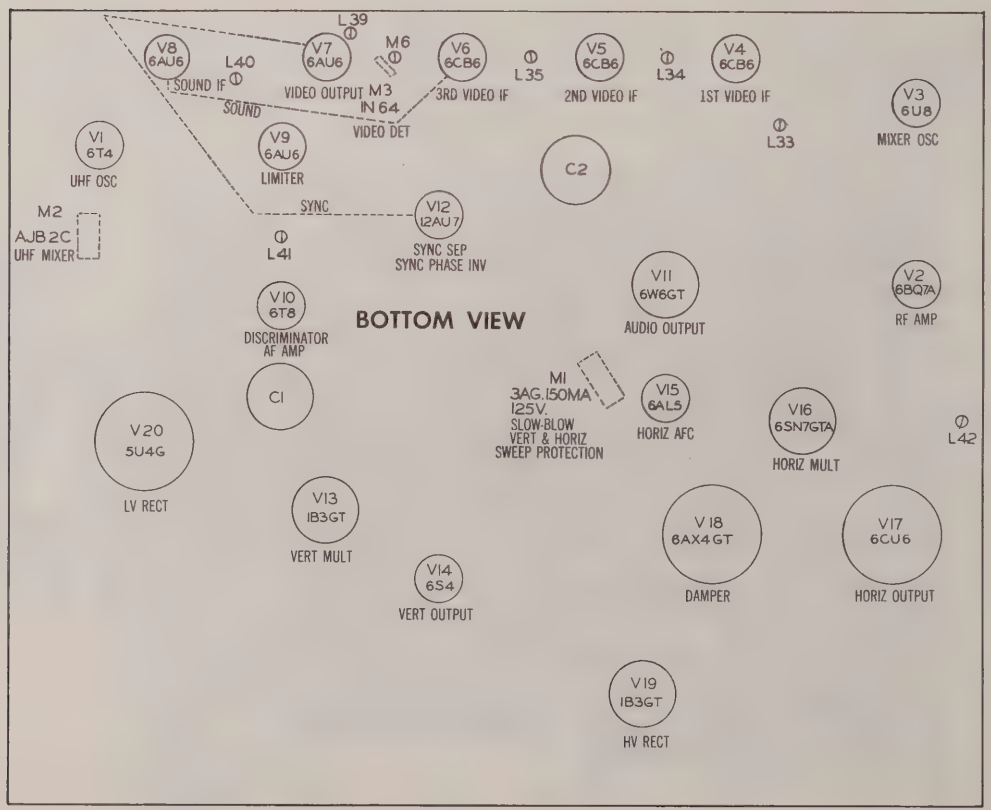


UHF TUNER-LEFT SIDE

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6T4	▲■1. 4KΩ	22KΩ	. 1Ω	0Ω	1. 1Ω	22KΩ	▲■1. 4KΩ		
V 2	6BQ7A	†1. 8KΩ	†230KΩ	INF	0Ω	. 1Ω	INF	*100KΩ 1. 1Meg	0Ω	0Ω
V 3	6U8	■300Ω	3[illegible]KΩ	■70KΩ	0Ω	. 1Ω	†5KΩ	0Ω	0Ω	22KΩ
V 4	6CB6	1Meg	56Ω	. 1Ω	0Ω	■1KΩ	■1KΩ	0Ω		
V 5	6CB6	1Meg	56Ω	. 1Ω	0Ω	■1KΩ	■1KΩ	0Ω		
V 6	6CB6	. 1Ω	220Ω	. 1Ω	0Ω	■1KΩ	■1KΩ	0Ω		
V 7	6AU6	1Meg	0Ω	. 1Ω	0Ω	†5. 6KΩ	†20KΩ	2KΩ		
V 8	6AU6	. 6Ω	0Ω	. 1Ω	0Ω	■1KΩ	■1KΩ	82Ω		
V 9	6AU6	270KΩ	0Ω	. 1Ω	0Ω	■1KΩ	■20KΩ	0Ω		
V 10	6T8	100KΩ	100KΩ	200KΩ	. 1Ω	0Ω	0Ω	0Ω	4. 7Meg	†470KΩ
V 11	6W6GT	NC	0Ω	†500Ω	†3. 5KΩ	500KΩ	TP	. 1Ω	▲35KΩ 9. 5KΩ	
V 12	12AU7	†600KΩ	4. 7Meg	0Ω	0Ω	0Ω	†3. 5KΩ	20KΩ	3KΩ	. 1Ω
V 13	6SN7GTA	2Meg	▲1. 8Meg	0Ω	1Meg	▲270KΩ	0Ω	. 1Ω	0Ω	
V 14	6S4	NC	2. 5KΩ	1. 7Meg	. 1Ω	0Ω	1. 7Meg	NC	NC	▲3KΩ
V 15	6AL5	18Ω	18Ω	. 1Ω	0Ω	5Meg	0Ω	5Meg		
V 16	6SN7GTA	4. 7Meg	†7. 5KΩ	2KΩ	90KΩ	†200KΩ	2KΩ	0Ω	. 1Ω	
V 17	6CU6	NC	. 1Ω	NC	†13. 5KΩ	470KΩ	TP	0Ω	27Ω	Top Cap ▲21Ω
V 18	6AX4GT	NC	NC	8Meg	NC	†40Ω	NC	. 1Ω	0Ω	
V 19	1B3GT		PINS	1 - 8	HAVE	INFINITE	RESISTANCE			Top Cap ▲546Ω
V 20	5U4G	NC	▲30KΩ 15KΩ	NC	23Ω	NC	21Ω	TP	▲30KΩ 15KΩ	
V 21	17HP4	. 1Ω	†300KΩ	Pin 6 0Ω	Pin 10 ▲1. 5KΩ	Pin 11 †180KΩ	Pin 12 0Ω			

* MEASURED WITH "FRINGE-LOCAL" SWITCH IN "FRINGE" POSITION.
▲ MEASURED IN "UHF" POSITION.
■ MEASURED FROM 140V LINE.
† MEASURED FROM PIN 8 OF V20.
▲ MEASURED FROM PIN 3 OF V18.
NC - NO CONNECTION
TP - TIE POINT
ALL MEASUREMENTS TAKEN IN "VHF" POSITION WITH "FRINGE-LOCAL" SWITCH IN "LOCAL" POSITION UNLESS OTHERWISE DESIGNATED.



TUBE PLACEMENT CHART

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Do not remove the horizontal oscillator tube (V16) to disable the high voltage. The high voltage lead should be securely taped and kept away from chassis.

VIDEO IF ALIGNMENT

Connect the negative lead of a 1.5 volt battery to the ungrounded side of C36. Connect the negative lead of a 3.5 volt battery to the ungrounded side of C39. Connect both positive leads to chassis. Set the contrast control fully counter clockwise.
Fringe-local switch to local position.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side to pin 1 (grid) of 6CB6 (V4). Low side to chassis.	43MC (10MC Swp)	47.25MC	Any non-interfering channel.	Vert. amp. to point Ⓐ thru 10KΩ. Low side to chassis.	A1	A second signal generator to be used for markers should be coupled to point B. Adjust to place 47.25MC marker in trap notch as in Fig. 1. Use enough sweep output so that trap notch is plainly visible on scope. It is possible to obtain two settings of A1. The correct setting is with A1 furthest out of coil form.
2.	"	"	"	42.75MC 45.75MC	"	"	A2	Adjust for maximum response between 42.75MC and 45.75MC markers.
3.	"	"	"	45.75MC	"	"	A3	Adjust to place 45.75MC markers at 60% on response curve.
4.	"	"	"	42.75MC	"	"	A4	Adjust to place 42.75MC marker at 60% on response curve. Repeat steps 2, 3 and 4 until response is similar to Fig. 1. Recheck A1 trap setting.
5.	1KΩ	High side to point Ⓑ. Low side to chassis.	"	45.75MC	Any unused channel between 7 and 13.	"	A5, A6	Connect high side of marker generator to tuner chassis. (Leave low side disconnected). Adjust A5 for maximum gain while placing 45.75MC marker at 50% on response curve as in Fig. 1. Adjust A6 for maximum gain and overall response with proper tilt. It may be necessary to alternally adjust A5 and A6 several times to obtain response within limits shown in Fig. 1.
6.	"	High side to point Ⓓ thru 1KΩ. Low side to chassis.	43MC (10MC Swp)	42.75MC 45.0MC 45.75MC	Any unused channel.	"	A7	Set VHF tuner to UHF position. Adjust A7 for MINIMUM tilt on response curve as in Fig. 1. This adjustment need be made only when combination UHF-VHF tuner is used in set.

SOUND IF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
7.	.005MFD	High side to point Ⓐ. Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel.	DC probe to point Ⓒ thru 10KΩ. Common to chassis.	A8, A9, A10	Attenuate generator output to maintain 6.5 to 7 volts for accuracy. Adjust for maximum deflection.
8.	"	"	"	"	"	A11	Adjust for zero reading. A negative and positive reading will be obtained on either side of the correct setting.

OSCILLATOR ALIGNMENT

Loosely couple an RF signal generator to the grid of the 1st video IF amp. (V4) and tune it accurately to 45.75MC.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Fig. 2	Thru matching pad (Fig. 2) to antenna terminals.	213MC (10MC Swp)	211.25MC	13	Vert. amp. thru 10KΩ to point Ⓐ. Low side to chassis.	A12	Adjust to make markers coincide on response curve.
10.	"	"	207MC (10MC Swp)	205.25MC	12	"	A13	Adjust (compress or expand coil) to make markers coincide on response curve.
			201MC (10MC Swp)	199.25MC	11		A14	
			195MC (10MC Swp)	193.25MC	10		A15	
			189MC (10MC Swp)	187.25MC	9		A16	
			183MC (10MC Swp)	181.25MC	8		A17	
			177MC (10MC Swp)	175.25MC	7		A18	
11.	"	"	85MC (10MC Swp)	83.25MC	6	"	A19	Adjust to make markers coincide on response curve.
12.	"	"	79MC (10MC Swp)	77.25MC	5	"	A20	Adjust (compress or expand coil) to make markers coincide on response curve.
			69MC (10MC Swp)	67.25MC	4		A21	
			63MC (10MC Swp)	61.25MC	3		A22	
			57MC (10MC Swp)	55.25MC	2		A23	

RF AND MIXER ALIGNMENT

The RF and mixer portion of this receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

UHF TUNER ALIGNMENT

The UHF tuner has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

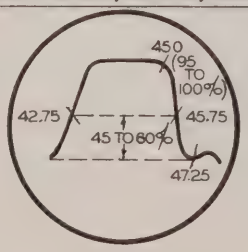


FIG. 1

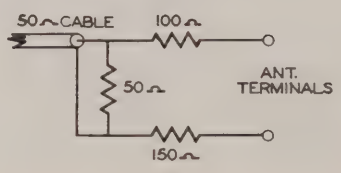


FIG. 2

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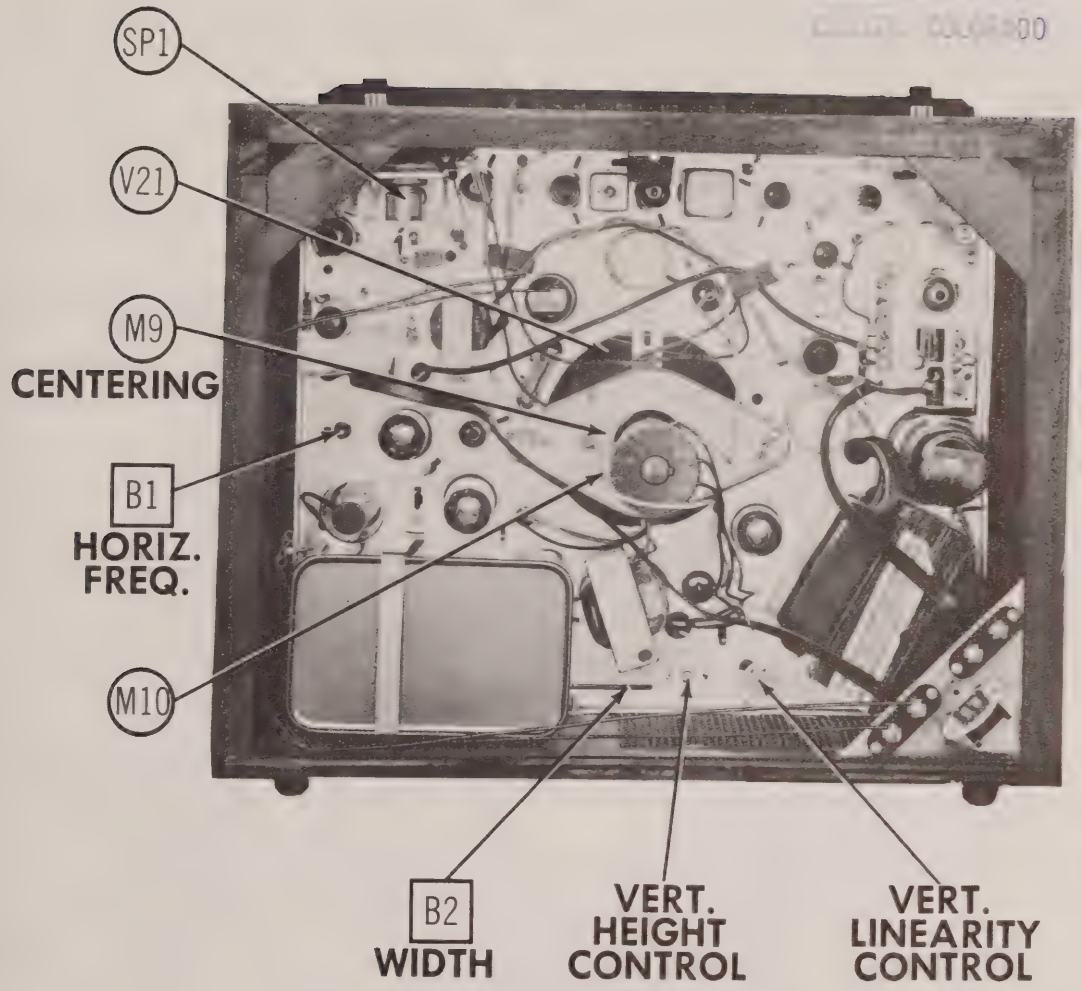


CABINET–REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station preferably a test pattern.

Set the horizontal hold control to its mid-range position.

Turn the horizontal frequency slug (B1) slowly clockwise while switching on and off channel until picture just loses sync. Turn B1 counter clockwise until picture regains sync then continue for 1/2 turn in the same direction.

The picture should hold sync at both extreme ends of the horizontal hold control.

If necessary, readjust B1 slightly and test for sync or pull-in, as above.

Adjust the width slug (B2) for a picture slightly wider than necessary to fill the picture mask horizontally.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss Of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V17, V18 and V20. Check adjustment B2. Check R95. R99, C80, C81, T2, T4A and other associated components.

DRIVE LINES

Check by substitution V17 and V18. Check C80, C81, R95, R99, T2, T4A and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V17 and V18. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V16, V17 and V18. Check C76 for open. Check L42, C77, R93, R4 and other associated components.

XMAS TREE EFFECT

Check by substitution V16, V17 and V18. Check T2 and T4 for internal arcing. Check L42, C77, C74, C78, C81, R93 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V13 and V14. Check waveform W8.

If Satisfactory	If Unsatisfactory
Check T3, T4B, C70, R100, R82 and other associated components.	Check C65, C67, C69, R80, R78 and other associated components.

INSUFFICIENT SWEEP

Check by substitution V13 and V14. Check height and vertical linearity controls for proper operation. Check R80, T3 and other associated components.

COMPRESSED AT BOTTOM

Check by substitution V13 and V14. Check R100, R78, C67, C69, and other associated components.

COMPRESSED AT TOP

Check by substitution V13 and V14. Check C1C, R82, R6 and other associated components.

FOLDS

Check by substitution V13 and V14. Check C68, C69, R82, R81, T3 and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Substitute V12. Check C61, C62, C63, R66, R67, R74 and other associated components.

LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY

Substitute V13. Check vertical integrator network. Check R79, R78, R2, C67 and other associated components.

LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY

Check by substitution V15 and V16. Check horizontal AFC network. Check C72, C73, C77, L42, R93 and other associated components.

HORIZONTAL BENDING

Check by substitution V12, V15 and V16. Check horizontal AFC network.

VIDEO

LOSS OF VIDEO

Check by substitution V7 and V11. Check L38, R46, R48, C45, C46 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check video IF alignment.

POOR CONTRAST

Substitute V7. Check contrast control. Check C45, C46, L37, R46 and other associated components.

NEGATIVE PICTURE

Substitute V7. Check picture tube. Check video crystal detector network. Check L36, C45, C46, R45, R48 and other associated components.

SMEAR

Substitute V7. Check L36, L37, C45 and C46. Check video IF alignment.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V2, V3, V4, V5, V6 and V7 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V8, V9, V10 and V11. Check stages V10 and V11 using signal generator. Apply audio signal across R1.

If Satisfactory	If Unsatisfactory
Check audio detector and audio IF stages for component failure or change of value.	Check C57, C58, C59, C60, C1B, R62, R63, R59, T6, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A11 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak Or No Sound".

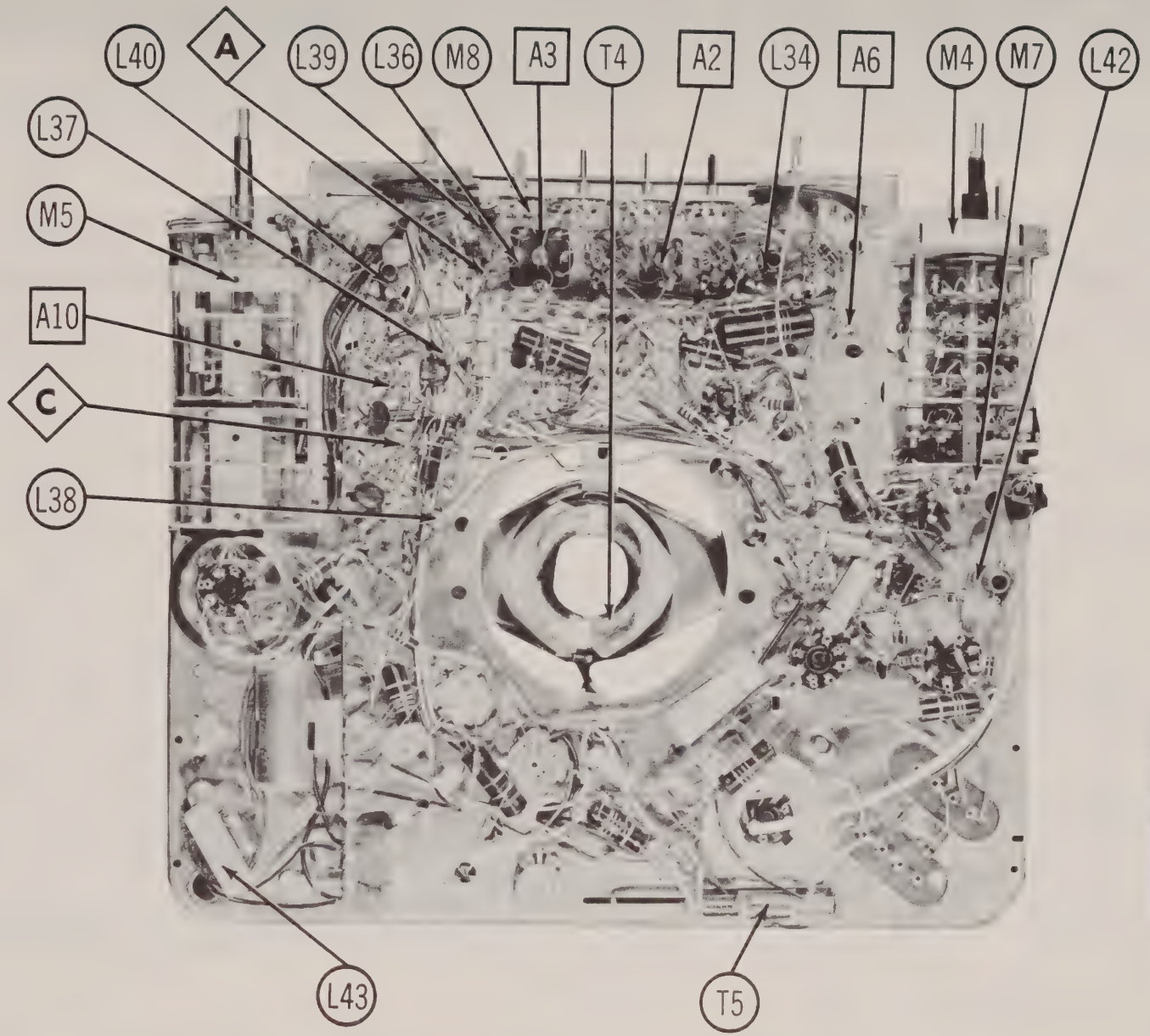
POWER

DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, substitute V20. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Substitute V20, Check B+ filter and decoupling network.



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CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

MAGNAVOX CHASSIS CMUA435AA,
CMUA436AA,CTA435AA, CTA436AA

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	UHF Osc.	6T4	6T4	7DK	
V2	RF Amplifier	6BQ7A	6BQ7A	8AJ	
V3	Mixer-Osc.	6U8	6U8	8AS	
V4	1st. Video IF Amp.	6CB6	6CB6	7CM	
V5	2nd. Video IF Amp.	6CB6	6CB6	7CM	
V6	3rd. Video IF Amp.	6CB6	6CB6	7CM	
V7	Video Output	6AU6	6AU6	7BK	
V8	Sound IF Amp.	6AU6	6AU6	7BK	
V9	Limiter	6AU6	6AU6	7BK	
V10	Discriminator-AF Amplifier	6T8	6T8	9E	
V11	Audio Output	6W8GT	6W8GT	7S	
V12	Sync Separator-Sync Phase Inv.	12AU7	12AU7	9A	
V13	Vert. Mult.	6SN7GTA	6SN7GTA	8BD	
V14	Vert. Output	6B4	6B4	8AC	
V15	Horiz. AFC	6AL5	6AL5	6BT	
V16	Horiz. Mult.	6SN7GTA	6SN7GTA	8BD	
V17	Horiz. Output	6CU6	6CU6	6AM	6BQ6G used as an alternate
V18	Damper	6AX4GT	6AX4GT	4CG	
V19	HV Rectifier	1B3GT	1B3GT	3C	
V20	LV Rectifier	5U4G	5U4G	5T	

CATHODE-RAY TUBE

ITEM No.	MAGNAVOX PART No.	CBS HYTRON PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.	RETMA BASE TYPE	NOTES
V21	17HP4	17HP4 / 17RP4 17HP4B ①	17HP4 / 17RP4	17HP4 / 17RP4	17HP4 / 17RP4	12L 12L	① Aluminized ② Circuit change necessary
	21YP4	21YP4 21YP4A ①	21YP4 21YP4A ①	21YP4 21YP4A ① 21AP4 ②	21YP4 21YP4A ①	12L 12L	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: MALLORY PART No.	REPLACEMENT DATA: PYRAMID PART No.	REPLACEMENT DATA: SANGAMO PART No.	NOTES
C1A	.02	350	270031-53			FP385.5 TC39	TM-B04020-450 TD-50-B0	Q-323	
B	.01	350							
C	50	50							
D	.02	350							
C2A	.03	350	270031-55			FP372	TM-B019 TD-30-B0	T-325	
B	.05	350							
C	.100	300							
C3	10	350	270087-33					MT-4520 ① MT-4530	Note 1
C4	.02		250121-103						
C5	.02		250121-113						
C6			250188-8						
C7	3.7		250121-119						
C8			250188-7						
C9	3.7		250121-119						
C10	.68		250121-113						
C11			250188-8						
C12	1.3		250121-115						
C13	3.3-4		250120-3						
C14	470		250175-8	DD-471	831-471	UC-5347			
C15	470		250175-8	DD-471	831-471	UC-5347			
C16	47		250175-21	DD-470	831-470	UC-5447			
C17	39		250175-20	DD-390	831-390	UC-5439			
C18	39		250175-20	DD-390	831-390	UC-5439			
C19			250188-6						
C20	10		250121-127	D5-100	GP1K-100	UC-541			
C21	470		250175-8	DD-471	831-471	UC-5347			
C22	470		250175-8	DD-471	831-471	UC-5347			
C23	1500		250175-10	DD-152	801-0025	UC-5325			
C24	470		250175-8	DD-471	831-471	UC-5347			
C25	.18		250216-6						
C26	.56		250216-4						
C27	1.8		250121-117						
C28	.15		250207-5	D5-150	GP1K-150	UC-5415			
C29	3.3		250121-131	TCZ-3.3	NP0A-3R3	ET-5533			
C30	470		250175-8	DD-471	831-471	UC-5347			
C31	10		250088-134	TCH-10	N750K-100	NT-541			
C32	6		250088-127						
C33	1500		250175-10	DD-152	801-0025	DC-5325			
C34	470		250175-8	DD-471	831-471	UC-5347			
C35	470		250175-8	DD-471	831-471	UC-5347			
C36	.1	300	250202-12	DF-104		P7401	IMP3-P1	330201	
C37	680		250218-6	DD-681	831-681	UC-5368		K-1368	
C38	82	500	250159-2045	TCZ-82	NP0L-820			KH-1482	
C39	.22	300	250202-15			PT4032	IMP3-P32	330202	
C40	680		250218-10	DD-681	831-681	UC-5368		K-1368	
C41	680		250218-4	DD-681	831-681	UC-5368		K-1368	
C42	430		250218-1						
C43	680		250218-4	DD-681	831-681	UC-5368		K-1368	
C44	680		250218-4	DD-681	831-681	UC-5368		K-1368	
C45	39000		250175-7	DF-393	817-02				
C46	.1	300	250202-12	DF-104		P7401	IMP3-P1	330201	
C47	4.7		250211-133	TCZ-4.7	NP0A-4R7	ET-555			
C48	62		250218-7			N220K-620			
C49	470		250218-6	DD-471	831-471	UC-5347		K-1347	
C50	5000		250175-1	DD-502	811-005	DC-525		K-1250	
C51	68		250218-7			N220K-680			
C52	10		250087-3	D5-100	GP1K-100	UC-541		K-1410	
C53	5000		250175-1	DD-502	811-005	DC-525		C-1250	
C54	5000		250175-1	DD-502	811-005	DC-525		C-1250	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: MALLORY PART No.	REPLACEMENT DATA: PYRAMID PART No.	REPLACEMENT DATA: SANGAMO PART No.	NOTES
C55	100		250207-46	D5-101	GP1K-101	UC-531		K-1310	
C56	100		250218-8	DD-101	801-001	DC-521		K-1310	
C57	5000		250175-1	DD-502	811-005	DC-525	IMP5-D5	C-1250	
C58	5000		250175-1	DD-502	811-005	DC-525	IMP5-D6	C-1250	
C59	.0022	400	250211-3	D-222	GP3-333-322	PT6323	IMP5-D22	330633X	
C60	.015	600	250211-5			PT6315	IMP5-E15	330615	
C61	.0022	400	250211-3	D5-222	GP3-333-322	PT6323	IMP5-D22	330222	
C62	150	500	250159-99	D5-151	GP1K-151	MC5239		K-1315	
C63	.1	400	250202-13	DF-104		P7401	IMP4-P1	330401	
C64A	2200					DC-522	IMP5-D2	C-1230	
B	4700		e250186-1	eDC-100	e1405-01	DC-525	IMP5-D5	C-1250	
C	4700					DC-525	IMP5-D6	C-1250	
C65	5000		250218-13	DD-502	811-005	DC-525	IMP5-D5	C-1250	
C66	1000		250218-8	DD-102	801-001	DC-521	IMP5-D1	K-1210	
C67	2700	500	250186-1069			MCM641		CR-1227	
C68	.047	400	250212-7						
C69	.1	400	250211-13	DF-104		PT401	IMP4-P1	330401	
C70	.047	400	250211-11	DF-503		PT4147	IMP4-S47	3304147	
C71	.0022	600	250201-4	D-222	GP3-333-322	PT6323	IMP5-D23	3306233	
C72	1000		250218-8	DD-102	801-001	DC-521	IMP5-D1	K-1210	
C73	1000		250218-8	DD-102	801-001	DC-521	IMP5-D1	K-1210	
C74	.1	600	250202-13	DF-104		PT601	IMP6-P1	330601	
C75	.0047	400	250212-6			MCM465		CR-1247	
C76	.047	200	250212-5						
C77	3900	500	250161-5041			MCM463		CR-1239 KH-1336	
C78	360	500	250159-5060					K-1315	
C79	1000		250218-8	DD-102	801-001	DC-521	IMP5-D1	K-1210	
C80	270	500	250159-5057	TCZ-270	NP0-335-271	MCM241		KH-1337	
C81	1000		250211-1	DD-102	801-001	DC-521	IMP5-D1	K-1210	
C82	.047	400	250211-11	DF-503		PT4147	IMP4-S47	3304147	
C83	.047	400	250211-11	DF-503		PT4147	IMP4-S47	3304147	
C84	1000	1000	250212-13	DD5-102	IR5KV-102	MCM300		C-1310	
C85	.1	400	250211-13	DF-104		PT601	IMP6-P1	330601	
C86	10000	1000	250219-2						
C87	10000	1000	250219-1						

e Items C64A, C64B, C64C, R75A, R75B, R75C are combined in one unit.
* Connect negative leads together.
Note 1. Semi-polarized unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	REPLACEMENT DATA: CENTRALAB PART No.	REPLACEMENT DATA: MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	D230156-44	Q13-157	A47-1Meg-Z	B-70-6	U-53	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWS-12	Not Req.	UE-26	Attach to R1A
R2A	1.25Meg	½	D230156-9	Q11-138	A47-1.25Meg-S	B-60	U-155	Vert. Hold
B	Shaft		Not Req.	VQ	FS-3	Not Req.	Not Req.	Attach to R2A
R3A	100KΩ	½	D230159-10	Q11-138	A47-100K-S	B-40	U-41	Brightness - Note
B	Shaft		Not Req.	VQ	FS-3	Not Req.	Not Req.	Attach to R3A
R4A	25KΩ	½	D230159-9	Q11-139	A47-25K-S	B-36	U-39	Horiz. Hold
B	Shaft		Not Req.	VQ	FS-3	Not Req.	Not Req.	Attach to R4A
R5A	2000Ω	½	D230156-43	Q17-111		AB-705	U-7	Contrast
B	Shaft		Not Req.	Not Req.		AK-3	Not Req.	Attach to R5A
R6	3000Ω	1	250130-3		39-3000			Vert. Linearity (Wire wound)
R7A	2.5Meg	½	D230145-3	Q11-139	A47-2.5Meg-S	AB-23	SU-255	Height
B	Shaft		Not Req.	VQ	FS2-1/4	AK-1	Not Req.	Attach to R7A

Note: Some versions may use an alternate control part no. 230139-7.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R1	10KΩ	½	230104-88	BTS-10K	
R2	100KΩ	½	230104-88	BTS-100K	
R3	22KΩ	½	230104-78	BTS-22K	
R4	1200Ω	1	230145-53	BTA-1200	
R5	100Ω	½	230104-80	BTS-100	
R6	100KΩ	½	230104-88	BTS-100K	
R7	470KΩ	½	230104-94	BTS-470K	
R8	470KΩ	½	230104-94	BTS-470K	
R9	8200Ω	½	230104-73	BTS-8200	
R10	470Ω	½		BTS-470	
R11	680Ω	½	230104-60	BTS-680	
R12	330KΩ	½	230104-93	BTS-330K	
R13	33KΩ	½	230104-76	BTS-33K	
R14	470KΩ	½	230104-94	BTS-470K	
R15	470KΩ	½	230104-94	BTS-470K	
R16	8200Ω	½	230104-73	BTS-8200	
R17	470Ω	½		BTS-470	
R18	680Ω	½	230104-60	BTS-680	
R19	330KΩ	½	230104-93	BTS-330K	
R20	33KΩ	½	230104-76	BTS-33K	
R21	470KΩ	½	230104-94	BTS-470K	
R22	3300Ω	½	230104-65	BTS-3300	
R23	68KΩ	½	230104-86	BTS-68K	
R24	22KΩ	½	230104-78	BTS-22K	
R25	150Ω	½	230104-63	BTS-150	
R26	15KΩ	½	230106-76	BTS-15K	Note 1
R27	100Ω	½	230104-80	BTS-100	
R28	150KΩ	½	230106-78	BTS-150K	Note 1
R29	10KΩ 5%	½	230094-183	BTS-10K 5%	
R30	56Ω	½	230104-47	BTS-56	
R31	1000Ω	½	230104-82	BTS-1000	
R32	1000Ω	½	230104-82	BTS-1000	
R33	82000Ω 5%	½	230094-185	BTS-82000 5%	
R34	56Ω	½	230104-47	BTS-56	
R35	1000Ω	½	230104-82	BTS-1000	
R36	10KΩ 5%	½	230094-183	BTS-10K 5%	
R37	330Ω	½	230104-64	BTS-330	
R38	1000Ω	½	230104-84	BTS-1000	
R39	470Ω	½		BTS-470	
R40	1Meg	½	230104-98	BTS-1Meg	
R41	1Meg	½	230104-98	BTS-1Meg	
R42	56000Ω 5%	½	230094-177	BTS-5600 5%	
R43	1Meg	½	230104-98	BTS-1Meg	
R44	10KΩ	½	230104-74	BTS-10K	
R45	330KΩ	½	230104-93	BTS-330K	
R46	560Ω	2	230106-71	BTS-560Ω	
R47	470KΩ	1	230104-94	BTS-470K	
R48	27KΩ	1	230105-77	BTA-27K	Note 2
R49	82Ω	½	230104-49	BTS-82	
R50	1000Ω	½	230104-82	BTS-1000	
R51	270KΩ	½	230104-91	BTS-270K	
R52	47KΩ	½	230104-83	BTS-47K	
R53	1000Ω	½	230104-82	BTS-1000	
R54	33KΩ	½	230104-80	BTS-33K	
R55	100KΩ	½	230104-88	BTS-100K	
R56	100KΩ	½	230104-88	BTS-100K	
R57	68KΩ	½	230104-86	BTS-68K	
R58	4.7Meg	½	230104-106	BTS-4.7Meg	
R59	470KΩ	½	230104-94	BTS-470K	
R60	1.2Meg 5%	½	230094-233	BTS-1.2Meg 5%	
R61	1Meg 5%	½	230094-231	BTS-1Meg 5%	
R62	33KΩ	½	230105-58	BTA-33K	
R63	27KΩ	2	230105-55		
R64	470KΩ	½	230104-94	BTS-470K	
R65	4.7Meg	½	230104-106	BTS-4.7Meg	
R66	330KΩ	½	230104-92	BTS-330K	Note 5
R67	330KΩ	½	230104-93	BTS-330K	Note 5
R68	68KΩ	½	230104-84	BTS-68K	Note 1, 5
R69	150Ω	½	230104-53	BTS-150	
R70	1Meg	½	230104-98	BTS-1Meg	
R71	22KΩ	½	230104-78	BTS-22K	
R72	270KΩ	½	230104-87	BTS-2700	Note 6
R73	330Ω	½		BTS-330	Note 3, 6
R74	3300Ω	½	230104-68	BTS-3300	
R75A	22KΩ	½		BTS-22K	
B	8200Ω	½	e250186-1	BTS-8200	
C	8200Ω	½		BTS-8200	
R76	47KΩ	½	230104-82	BTS-47K	
R77	1Meg	½	230104-98	BTS-1Meg	
R78	270KΩ	1	230105-91	BTA-270K	
R79	1.5Meg	½	230104-100	BTS-1.5Meg	

RESISTORS (cont)

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R80	1.5Meg	1	230105-101	BTA-1.5Meg	Note 7
R81	12KΩ	½	230104-75	BTS-12K	
R82	1000Ω	½	230104-82	BTS-1000	
R83	270KΩ	½	230104-91	BTS-270K	
R84	180Ω	½	230104-53	BTS-180	
R85	180Ω	½	230104-53	BTS-180	
R86	18Ω	½	230106-41		
R87	100KΩ	½	230104-88	BTS-100K	
R88	100KΩ	½	230104-88	BTS-100K	
R89	470KΩ	½	230104-94	BTS-470K	
R90	4.7Meg	½	230104-106	BTS-4.7Meg	
R91	39000 5%	½		BTS-3900 5%	Note 1
R92	39000 5%	½		BTS-3900 5%	Note 4
R93	68000 5%	½	230094-179	BTS-6800 5%	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R94	82KΩ	½	230104-85	BTS-82K	
R95	300KΩ 5%	½	230094-214	BTS-300K 5%	
R96	18KΩ	½	230104-77	BTS-18K	
R97	470KΩ	½	230104-94	BTS-470K	
R98	7Ω	½	230104-43	BTS-27	
R99	13.5KΩ	5	240071-7		
R100	1500Ω	1	230105-64	BTA-1500	
R101	4700Ω	2	230105-70	BTS-4700	
R102	1000Ω	1	230105-62	BTA-1000	
R103	680Ω	1	230104-60	BTS-680	
R104	120Ω	1	230105-53	BTA-1200	
R105	120KΩ	½	230130-1	BTS-120K	
R106	1.2Meg	½	230104-100	BTS-1.2Meg	Note 7
R107	*		230130-1		Note 7

+ Items R75A, R75B, R75C, C64A, C64B and C64C are combined in one unit.
* Negative temperature compensating.
Note 1: Not used in some versions.
Note 2: Some versions may use a 18KΩ 1 watt resistor in this application.
Note 3: Some versions may use a 390Ω resistor in this application.
Note 4: Some versions may use a 15000Ω resistor in this application.
Note 5: In late production chassis, R66 is changed to 68KΩ ½ watt resistor. When R68 is 68KΩ, R67 and R68 are not used.
Note 6: In late production chassis, R73 is changed to 330Ω 1 watt resistor and R72 is changed to 330Ω ½ watt resistor.
Note 7: In late production chassis, R80 is changed to 1.2Meg resistor. When R80 is 1.2Meg, R106 and R107 are added and parallel.

TRANSFORMER (POWER)

ITEM No.	RATING	REPLACEMENT DATA: MAGNAVOX PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	RCA TYPE No.	Halldorson PART No.	Thordarson PART No.
	PRI.	SEC. 1	SEC. 2						
T1	117VAC ① 1.6A	194VCT .230ADC ② 3A	5VAC ③ 3A	300077-1	P-8187 ① ②	P3055 ①	R-61BC1 ③	P8733 ① ④	26R33 ② ④
	SEC. 3	SEC. 4	SEC. 5						
	6.3VAC ④ 9.3A								

① Use original mounting support.
② Parallel and phase 6.3V windings Sec. #3.
③ Parallel and phase 6.3V @ 6A Sec. #3, tape 6.3V @ 1.2A.
④ Tape low taps on HV sec., and extra 5V winding.
⑤ Drill new mounting holes.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA: MAGNAVOX PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Horiz. Output Trans.	380605 380605-1⑤							
T3	Vert. Output Trans.	330057-1	Z1808	A-3039	Z35T1	V312	A-8141	26S54	A-104X
T4A	Tube Shunts (18.5MΩ	380567-3	DF805 ①	MDF-73②	Z32HD②	T70F18/43 ②	DY-11A ①	Y-9①	Y-23 ①
B	Vert. (41MH)						②		
T5A	Width-Parallel Coil (4.2-22MH)	380587-3						WC-24	
B	Width-Series Coil (.23-3.3MH)								

① Alternate horizontal output trans.
② Use original yoke damping network.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI	IMPEDANCE: SEC	MAGNAVOX PART No.	REPLACEMENT DATA: Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	NOTES
T6	5.4KΩ	3.6Ω	320068-2	A-3849	A-3018	Z1U6 ①	S-4X ①	22S45 ①	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V. C. IMP.	MAGNAVOX PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	5 1/4"	PM	3.2Ω	563997	ST-803 Mod. P525-V	52AJ	

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: MAGNAVOX PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	UHF Ant. Coil	0Ω						
L2	UHF Ant. Coil End Inductor	0Ω		380415-44				
L3	UF Trap Coil	0Ω						
L4	UHF RF Coil	0Ω						
L5	UHF RF Coil End Inductor	0Ω						
L6	UHF Osc. Coil	0Ω						
L7	UHF Osc. Coil End Inductor	0Ω						
L8	UHF Osc. Coil	0Ω						
L9	UHF Cathode Choke	1.1Ω		380532-7				
L10	Fil. Choke	0Ω		380574-8				
L11	Fil. Choke	0Ω		380574-8				
L12	Fil. Choke	0Ω		380574-8				
L13	RF Choke	0Ω		380574-8				

CHASSIS CMUAA635AA, CMUAA636AA, CTA635AA, CTA636AA

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA MAGNAVOX PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L14	IF Coupling	0Ω		360574-12				
L15	RF Choke	0Ω		360574-14				
L16	IF Trap	0Ω						
L17	IF Trap	0Ω						
L18	VHF Ant. Trans.	0Ω CT	0Ω	360490-2				
L19	IF Trap	.22Ω		360601-8				.47 Microhenry, IRC part #CLA
L20	VHF Ant. Coils	0Ω						
L21	VHF Ant. Coil	0Ω						Channel 13
L22	UHF IF Coil	0Ω		360602-1				
L23	VHF Neut. Coil	0Ω						
L24	VHF RF Coil	0Ω						Channel 13
L25	VHF RF Coils	0Ω						
L26	VHF Mixer Grid Coil	0Ω						Channel 13
L27	VHF Mixer Grid Coils	0Ω						
L28	VHF Osc. Coils	0Ω						
L29	VHF Osc. Coil	0Ω						Channel 6
L30	VHF Osc. Coil	0Ω						Channel 13
L31	RF Choke	.8Ω		360601-9	19-1000		4602	1 Microhenry, IRC part #CLA
L32	VHF Conv. Plate	0Ω		360603-1				
L33	1st. Video IF	.2Ω		360540-1	17-4524 *	TV-113	6219 ■	
L34	2nd. Video IF	.1Ω	.1Ω	360581-1	17-4522	TV-130	6219	
L35	3rd. Video IF	.1Ω	.1Ω	360582-1		TV-128 ▲	6233 ▲	Includes 47.25MC trap
L36	Shunt Peaking Coil	13Ω		360443-37	19-3660		4650	670 Microhenries
L37	Series Peaking Coil	9Ω		360443-39	19-3300 ▰	TV-190 ▰	6155 ▰	340 Microhenries, wound on 47KΩ resistor
L38	Shunt Peaking Coil	12Ω		360443-28	19-3500	TV-188	6174	450 Microhenries
L39	4.5MC Trap	.6Ω		360584-1	20-1005	TV-151	1469	
L40	Sound IF	.6Ω		360584-1	17-3400	TV-151	1469	
L41	Discriminator	1.2Ω	1.2ΩCT	360512-1	17-3496	TV-114	6204	
L42	Horiz. Osc.	55Ω		360579-1	19-1576	TV-163	6210	

* Use winding with 56KΩ resistor.
■ Use one winding only.
▲ Use adaptor plate.
▰ Parallel with 47KΩ resistor.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA MAGNAVOX PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.
L43	.230ADC	38.4Ω	.68HY	320058-2	C-2326 ①	C-2996 ①	C-17X ①	C5037 ①	26C44①

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA MAGNAVOX PART No. FUSE	MAGNAVOX PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1	3AG S/B	150MA 125V	180157-24		313.150 (3AG-S/B-150MA)	357001	MDL 15/100	4405

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA MAGNAVOX PART No.	REPLACEMENT DATA SYLVANIA PART No.	NOTES
M2	AJB2C	530036-1	1N82 or 1N82A	UHF Mixer
M3	1N64		1N60 or 1N132	Video Detector

MISCELLANEOUS

ITEM No.	PART NAME	MAGNAVOX PART No.	NOTES
M4	Tuner	700458-1	VHF - All chassis
M5	Tuner	700459-1	UHF - Ch. CMUA435AA, CMUA436AA
M6	Video Det.Assy.	360607-1	Includes M3, R38, capacitor and coils.
M7	Switch	160247-1	VHF-UHF - Ch. CMUA435AA, CMUA436AA
M8	Switch	160169-3	Local-fringe
M9	Centering Device	635116-1	
M10	Ion Trap	360492-7	

TROUBLE SHOOTING AIDS (cont)

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HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V16, V17, V18 and V19. Check M1 fuse. Check waveform W15.

If Satisfactory	If Unsatisfactory
Check T2, T4A, T5, C74, C83, C3, C82, R98, R99 and other associated components.	Check L42, C77, C78, C81, R95, R93, R92 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V17, V18 and V20. Check R98, R99, R95, C81, C60, C3 and other associated components.

BLOOMING

Check by substitution V17, V18, V19 and V20. Check R99, C81, C80 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss Of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak Or No Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V2, V3, V4, V5, V6, V7 and V11. Check video IF components for failure or change of value. With Raster, No Sound, No Picture UHF. Substitute V1.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

KEYSTONE EFFECT

Check T4 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.

UHF FINE TUNING DRIVE CORD STRINGING

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass, remove 3 wood screws holding metal strip at top of safety glass. Remove metal strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions.)

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horiz. oscillator circuit can be made from the rear panel of the chassis. Set the horiz. hold control at the mid-position of its range and adjust the horiz. frequency slug (L42) until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the discriminator secondary (L41) located on top of chassis. (See tube placement chart.)

FUSES

One fuse is used for horizontal and vertical sweep circuit protection. (For location see tube placement chart.)

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

1. Remove 10 push-on type control knobs from top panel of cabinet.
2. Remove 6 metal screws. Remove rear cover.
3. Remove 1 metal screw from antenna bracket. (Side.)
4. Remove 1 metal screw from rear underside of cabinet top.
5. Disconnect 2 speaker leads.
6. Remove 6 cabinet bolts. (3 on each side of cabinet bottom.)
7. Lift cabinet from chassis and mounting board.
8. Remove 1 speaker nut. Remove speaker.

PICTURE TUBE REMOVAL

1. Remove picture tube socket, ion trap and HV lead.
2. Loosen 2 front band nuts.
3. Remove picture tube.

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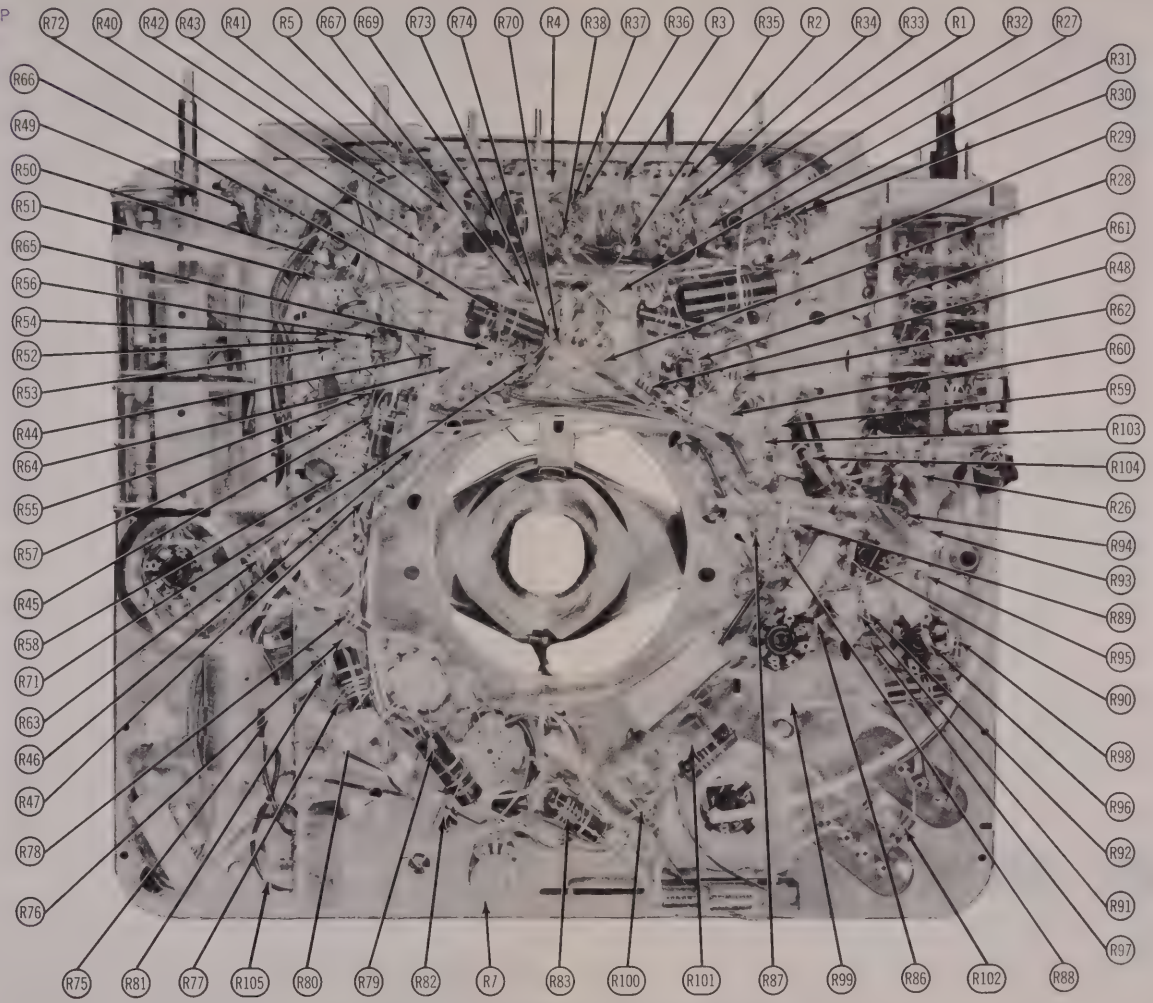

CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

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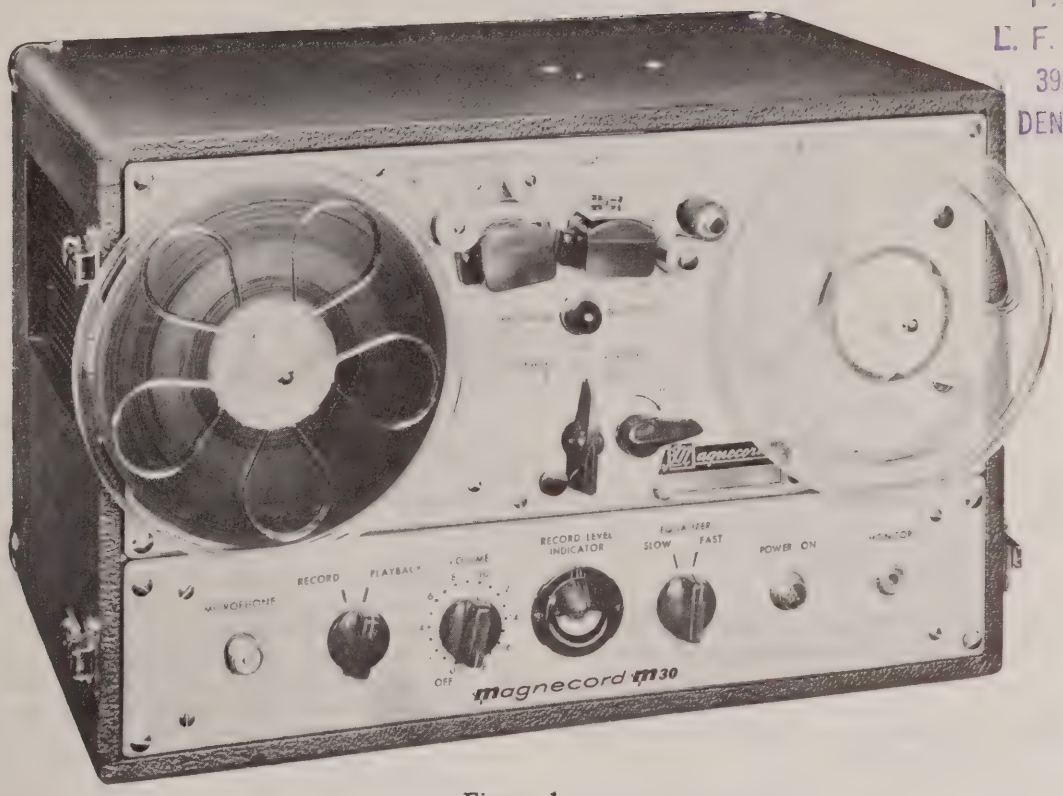

Figure 1

GENERAL INFORMATION

The Magnecord M30 Series Tape Recorders are mechanically alike. Models M-30, M-33, and M-34 use the Magnecord M30-AH mechanical unit. Variations are as follows:

Model M-30. Uses the M-30G amplifier.

Model M-33. Uses the M-33G amplifier.

Model M-34. Uses the M-34 auxiliary amplifier in conjunction with one of the above amplifiers.

These recorders are designed to record and play back two tracks of material on standard width recording tape, which doubles the recording and playing time on a reel of tape. Recordings can be made from a radio, television receiver, or phonograph, in addition to those made directly from a microphone.

CAUTION: Magnecord M-30 Series Recorders operate on 110-125 volt, 60 cycle AC only. Connecting to any other power may permanently damage the unit.

Manufactured by:

Magnecord Inc.
1101 South Kilbourn Ave.
Chicago 24, Illinois

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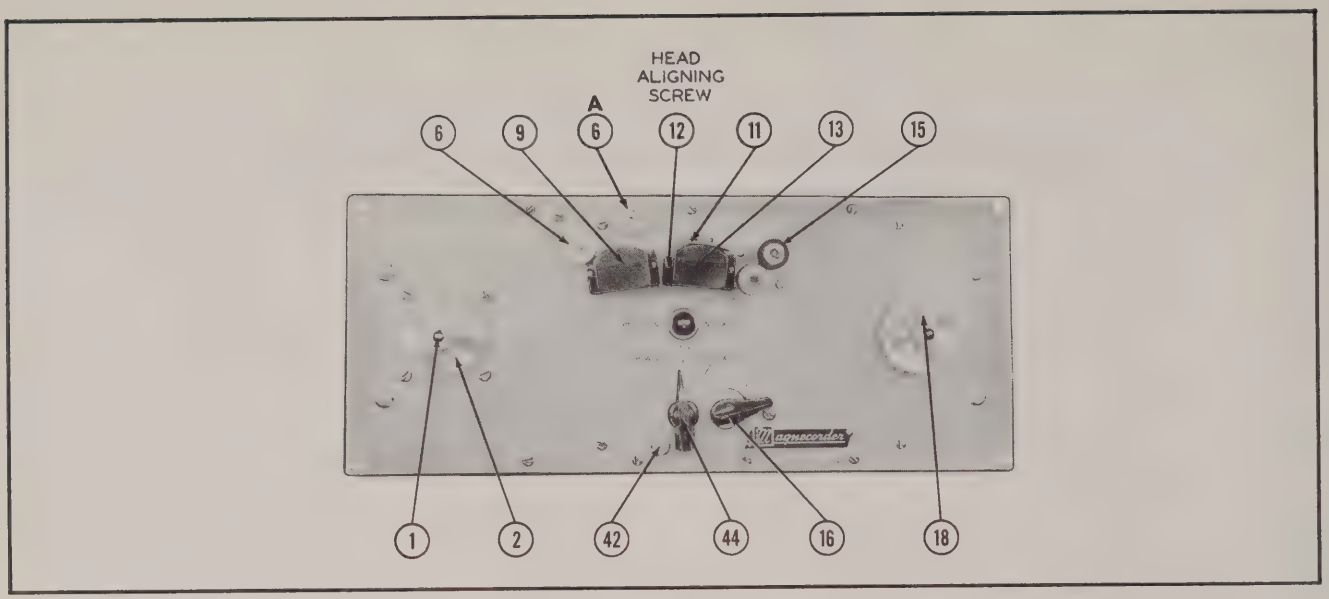

Figure 2

SPECIFICATIONS

Recording Speeds: 7 1/2" per second, or 3 3/4" per second, interchangeable with no tools required.

Rewind Speed: 1200 feet of tape (full 7" reel) rewound in 40 seconds.

Frequency Response: At 3 3/4" per second: from below 50 cps to 5KC ± 2db.

At 7 1/2" per second: 50 cps 10Kc ± 2db.

Motors: Shaded pole 117 volts 60 cycles AC drive motor:

Flutter: 0.3%.

Input Impedance: Microphone input: High impedance for crystal or hi-impedance microphone.

Phono input: Hi-impedance for crystal pick-up or detector output of tuner.

Output Impedance: Hi-impedance. May be connected to input of power amplifier or "phono" input of any radio, high fidelity or public address amplifier.

OPERATION INSTRUCTIONS

To Connect The Recorder —

1. Place the "On-Off-Volume" control in "Off" position and control knob (44) in "Stop" position.

2. Insert the female socket on the power cord into the power input receptacle in the rear of the unit.

3. Insert the AC power cord plug into a convenient wall receptacle of the proper rating.

Threading The Tape —

1. Before a reel of tape can be placed on the spindle, reel retaining knob (1) must be removed. To remove the reel knob, push in and turn counterclockwise to release the bayonet pin.

2. Place a reel of tape on the rewind flange (2). The tape should unwind from the top when the reel is turned clockwise, the coated, or dull side down.

3. Place an empty reel on the right (take-up) spindle (18).

NOTE: Make certain that the reel retaining knobs are replaced after the reels have been seated.

4. Unwind about 18 inches of tape and thread it as shown in Figure 1.

Speed Change —

The Magnecord M30 is provided with two capstans which allow for two speed operation. The smaller capstan (with the larger pressure roller) provides for the 3 3/4" per second tape speed while the larger capstan and smaller pressure roller provides for the 7 1/2" per second tape speed. Changing these capstans and rollers merely requires the removal of the knurled screws holding them in place, slipping the capstan and roller off and replacing them with the others. It is imperative that the surfaces of the shaft and capstan bore be extremely clean for proper fit.

To Make a Recording —

1. Turn on the unit by turning "On-Off-Volume" control in a clockwise direction.

2. Set the "Record-Playback" switch to "Record". This will switch on the phono and mike inputs to the amplifier and will set the circuits for recording. The record level indicator will glow green.

3. Set the "Equalizer" switch at either "Fast" or "Slow" position, depending upon which tape speed is to be used.

4. Adjust the "Volume" control so that peaks of volume cause the "Record Level Indicator" eye pattern to deflect until almost closed.

5. Turn the "Rewind-Stop-Forward" knob (44) to "Forward". It is necessary to depress the small

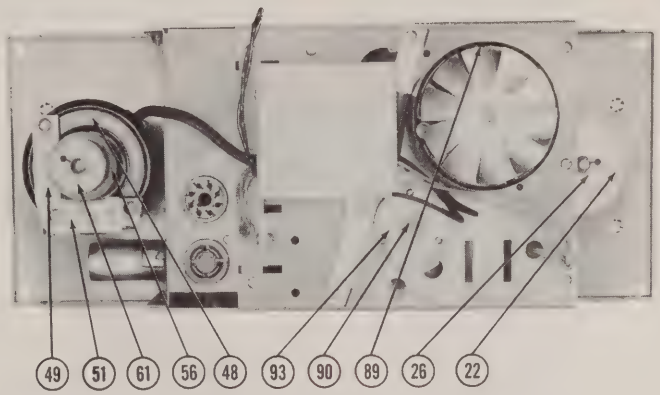

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Figure 3

safety button (42) before knob (44) can be placed in "Forward" position.

6. The machine is now recording. The red recording indicator on the transport mechanism will light, showing that the unit is recording.

7. The signal being recorded may be monitored at the monitor jack with headphones, or heard through an amplifier and speaker combination.

To Rewind a Tape —

1. Before rewinding, lift the tape clear of the record-playback head (13) and place it on top of head shield (11). This prevents excessive wear on the head during the rewind operation. The balance of the tape may remain in its normal path.

2. The tape may be rewound at any time by placing control knob (44) in "Rewind" position.

CAUTION: When switching from "Rewind" to "Forward", always pause at the "Stop" position long enough for the tape to come to a complete stop. Failure to do so may result in tape breakage due to the tight grip the capstan and pressure roller exert on the tape when control knob (44) is in "Forward" position.

To Playback a Tape —

1. Set the "Record-Playback" switch to "Play" position. This will cause both the red recording indicator on the transport mechanism and the record level indicator on the amplifier to become dark, acting as a quick reference for the position of the "Play-Record" switch.

2. Set the tape in motion by turning knob (44) to "Forward" position.

NOTE: The red recording indicator should not light when the recorder is being used for playback.

3. Adjust the "Volume" control for the desired listening level.

NOTE: If the playback sounds distorted, it may be that too much volume is being fed from the Magnecord to the external amplifier or radio being used in conjunction with the Magnecord M30. If this is the case, turn the Magnecord volume to a lower setting and turn the volume of the external amplifier or radio higher. It is not necessary to consider the position of the equalizer switch when playing back.

Hi-Speed Forward —

The Hi-Speed Forward mechanism is actuated by depressing control knob (16). In this position, the tape is driven up to a rate of 8 times the normal capstan or drive speed. It permits fast cueing or editing of any recorded tape. This Hi-Speed Forward switch is spring loaded, and the farther it is depressed, the faster the Hi-Speed Forward action. The "Rewind-Stop-Forward" control knob must be in the "Stop" position before actuating the Hi-Speed Forward mechanism.

To Erase a Tape —

To erase recorded tape, set the "Record-Playback" switch to "Record", disconnect the input, and turn the "Rewind-Stop-Forward knob (44) to "Forward".

NOTE: It is not necessary to erase tape before recording since the erase head is activated whenever the unit is in the record position, and the tape is automatically erased before passing over the record head.

INPUT CONNECTIONS

To Connect a Microphone —

Any high impedance microphone of good quality can be used. The microphone connector on the Magnecord amplifier is of the shorting type, silencing the microphone pre-amplifier when no microphone is used.

To Connect a Tuner —

To make recordings from a radio tuner, the tuner should be connected to the "Phono" input found on the rear connector plate.

To Connect a Radio or TV Receiver —

To make recordings from a standard radio or television receiver, the voice coil leads at the speaker should be connected to the "Phono" input of the Magnecord.

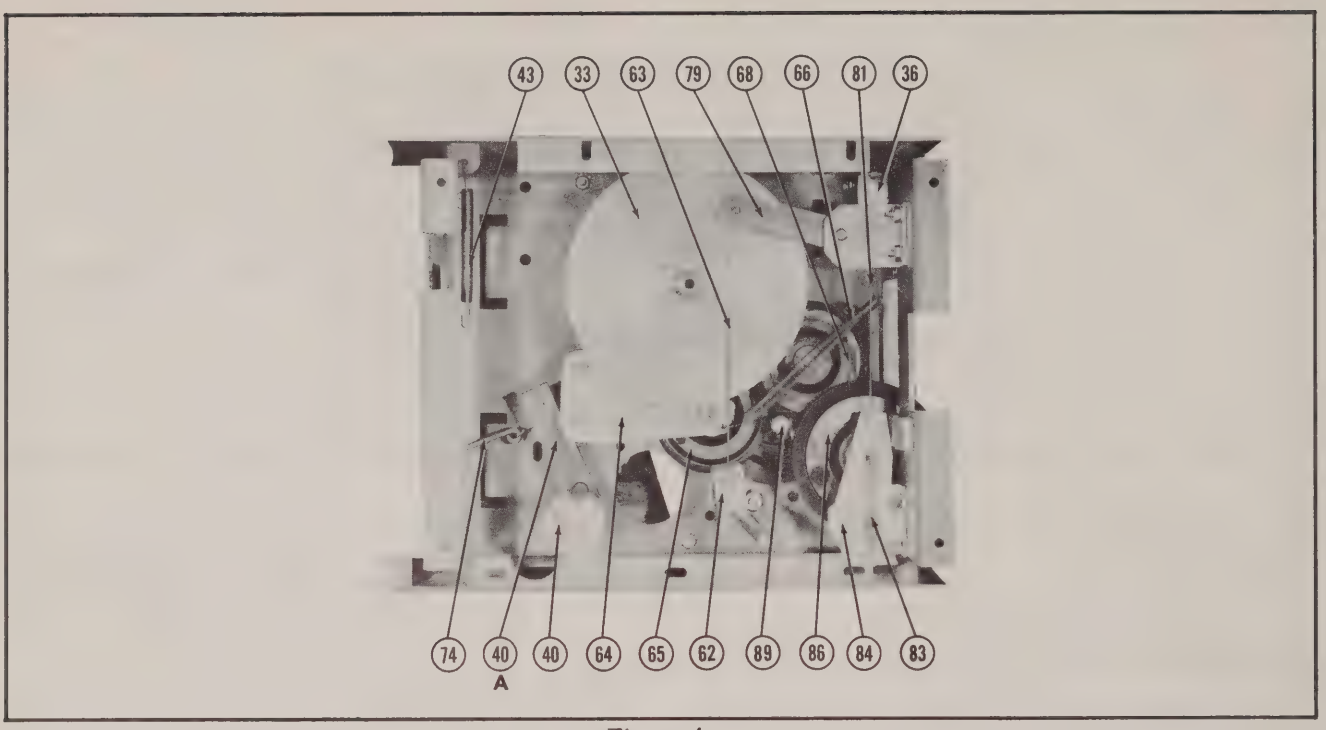

Figure 4

If desired, the Magnecord "Phono" input may be connected directly across the volume control of the radio or television receiver.

To Connect a Phonograph —

The output from most crystal pickups may be connected directly to the "Phono" input of the recorder.

To use a phonograph with a magnetic or reluctance type pickup it will be necessary to use a preamplifier. A preamplifier specified by the manufacturer of the pickup which is equipped with its own power supply should be used.

OUTPUT CONNECTIONS

Connecting The Output —

The Magnecord amplifier must be properly connected. Improper connections will result in high noise level. There are two output connections on the unit. The "Hi" is designed for use with radio, TV or public address systems. The "Lo" output is for use with professional-type, high fidelity amplifiers.

ADJUSTMENTS

Head Alignment —

The primary purpose in head alignment is to provide the maximum frequency response. For this purpose, it is not necessary to adjust the erase head.

The procedure consists of aligning the playback head with a one mil standard alignment tape. Several definite steps should be followed and these are outlined below:

The record reproduce head is mounted to the front panel by two screws in a hinge arrangement.

1. With an audio voltmeter or oscilloscope connected to the output of the playback amplifier, playback at 7 1/2" per second a portion of the alignment tape. Adjust the volume of the playback amplifier until a convenient reading is obtained.

2. Again start the tape running over the head and while observing the output reading, adjust the left hand head mounting screw (Fig. 2) for maximum reading. When this maximum has been reached, the head is properly aligned.

NOTE: It is advisable to first loosen the left hand mounting screw to make sure that when adjusting you will pass through the maximum reading. Final adjustment of the left hand screw should leave the head set for maximum reading.

Head Cover Adjustment For Hum —

The record reproduce head is equipped with a shield (11). Adjustment of this cover to reduce hum is as follows:

By rocking the head shield back and forth, you will notice an increase and decrease of the hum. Adjust the head shield to the position which gives lowest hum by pressing alternate ends of the head shield. The shield will remain in this position. This adjustment is made with the volume control turned to maximum and the tape mechanism running and "Record-Playback" switch in "Playback" position. It is possible to use either the unit hooked to a power amplifier or with a pair of high impedance phones plugged in the monitor jack. Realign the head after this adjustment.

CAUTION: Never let the head shield drop on the head. This not only affects the hum adjustment, but also the head alignment.

Fast Forward Drive Wheel Adjustment —

Adjusting fast forward wheel (86) is accomplished by the two screws (85) which are located on the top front of end plate (87). The fast forward wheel should be adjusted so that it does not turn when unit is in

normal forward speed. The clearance between the fast forward wheel and takeup hub (20) should be approximately 1/16 of an inch or less. It must not touch except in "Fast Forward" position. By the same procedure, the clearance between the drive motor shaft and fast forward wheel should be approximately 1/16 of an inch. Adjust the screws that hold micro switch (36) so that the switch turns on after the fast forward wheel engages the motor drive shaft and the fast forward takeup wheel.

Takeup Drive Wheel Adjustment –

Adjustment of takeup drive wheel (68) is accomplished by turning take-up arm adjusting screw (78). This adjustment determines the sequence of the takeup drive wheel engaging the takeup friction assembly. To adjust, loosen screw (78) and move the stop plate located beneath screw (78) so it just clears the takeup arm (77). It may be necessary to adjust the linkage adjustment so there is no lag in the switching from rewind to stop, or from forward to stop. This is accomplished by tightening or loosening elastic stop nut (71) which is accessible through a hole in the oscillator cover.

Rear Thrust Bearing Alignment –

With the unit placed front panel down remove thrust adjusting screw (90). Look at ball bearing (34) to see if it is centered in the hole. If not, tap the housing in whichever direction it takes to align it. Replace bearing screw and adjust. Minimum of .005 inch end play.

Flywheel Bearing Alignment –

It may sometimes become necessary to realign the flywheel bearings even though they are of the self-aligning type. To do this, turn the machine on and tap lightly on the flywheel with a wooden mallet or screw driver handle until the bearings are lined up and the flywheel is running free without binding. It may then be necessary to readjust for flywheel end play.

Speed Adjustment –

Strob discs are provided with each machine. Place one of these on the metal drive capstan (metal roller at 7 1/2" only). Viewed under a fluorescent light somewhere near the strob disc with the mechanical unit turned on, spokes will appear to form on the strob disc as it is turning. If these spokes apparently turn counterclockwise, the unit is too slow. If they turn clockwise, at a faster rate than two revolutions per minute, it is too fast.

The first item to check is the condition of the drive wheels for cleanliness. Check end play of the capstan flywheel (33). If it is too tight or loose, adjustment is made by tightening or loosening thrust adjusting screw (90). Check the pressure roller pressure; this should be one pound. To adjust this, either stretch or remove loops from the pressure arm spring (43). The takeup reel drag should be adjusted to five or six ounces (right hand reel). This is done by loosening or tightening lock nut (26) to the desired tension. The tension on the rewind reel is four ounces and is adjusted in the same manner as the takeup tension. Tools required for the job are a one pound scale and a number 8 Allen wrench.

Sometimes it is necessary to adjust the pressure roller for lateral alignment. To do this, remove the pressure roller and use a hollow shafted tool to very carefully bend the pressure roller shaft either to the right or left until the pressure roller will not cause the tape to move either toward or away from the front panel.

CLEANING

Due to the loss of oxide from the tape, it is necessary to clean the residue deposited on the head from time to time to insure good recordings. Use a soft cloth dipped in carbon tetrachloride. This should be done after each 15 or 20 hours of playing time.

NOTE: Care should be exercised in using carbon tetrachloride as saturation can cause damage to recording tape and to oilite bearings.

LUBRICATION

Most moving parts in this recorder are located in "Oilite" bearings, which retain oil over long periods of time. The "Oilite" bearings are kept oil damp by felt pad wicks. The wicks should be oiled, not the shafts or bearings themselves.

CAUTION: Do Not over-oil. Any excess oil seeps to the outer edges of the moving parts, causing slippage in the drive mechanism. Should this occur, wipe off parts thus affected with a soft cloth which has been dipped in carbon tetrachloride. The drive surfaces must be free of oil to function properly.

Lubricate as follows:

1. Forward drive motor: Two drops of SAE #20 oil, front and back bearings every six months.

2. Capstan shaft bearings: Two drops SAE #20 oil, front and back bearings every six months.

3. Pressure roller and tape guide roller shafts: Two drops of Finoil on each shaft, once a month.

CAUTION: It is important that there be no excess on these bearings or it will be deposited on the tape.

4. Idler wheels: Equipped with felt washer at hub. One drop of SAE #20 oil on felt washer every six months.

5. Rewind and Take-Up Clutch: Do not oil unless clutches begin to squeak; then one or two drops of oil on each of two felt pads.

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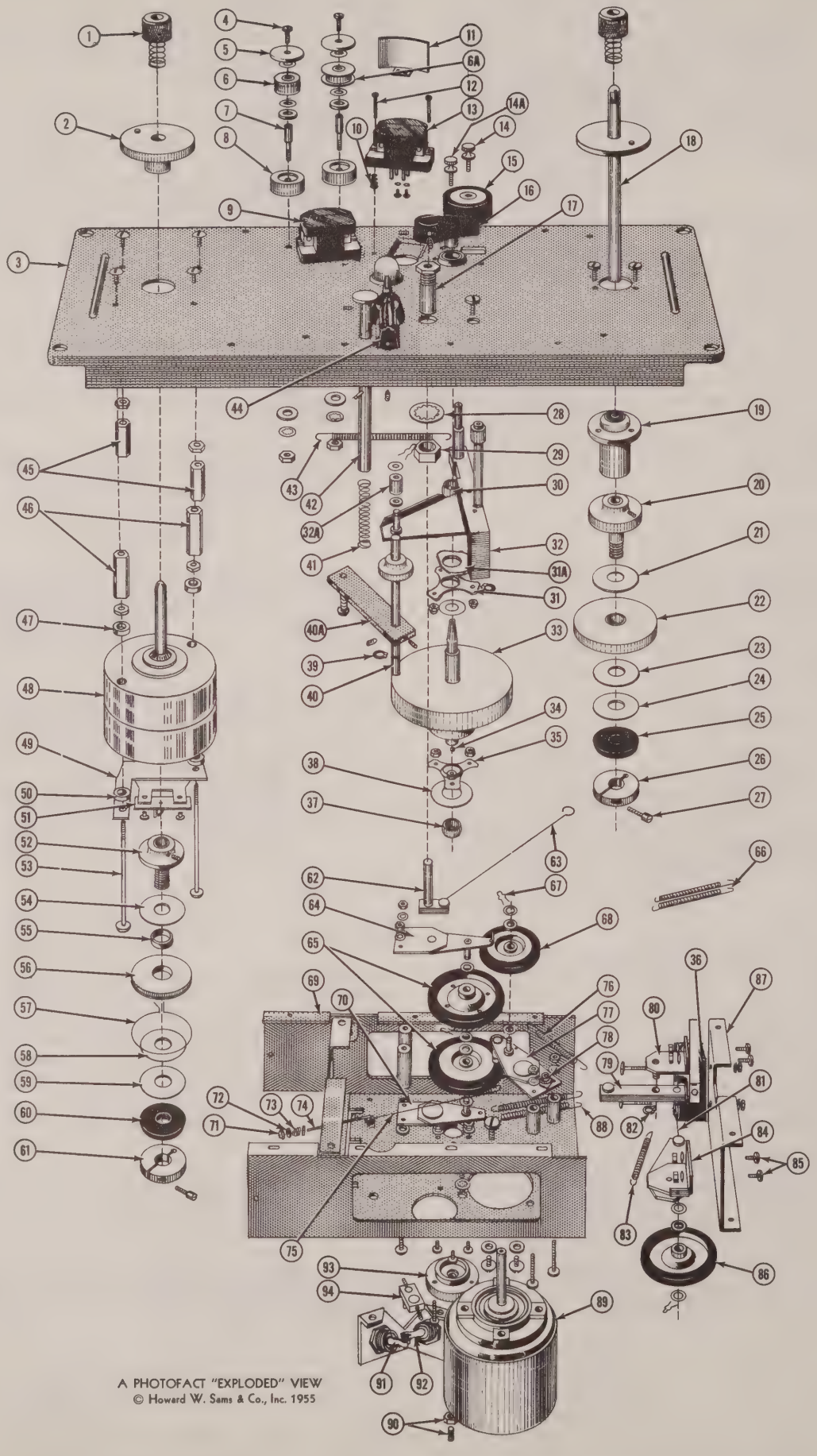
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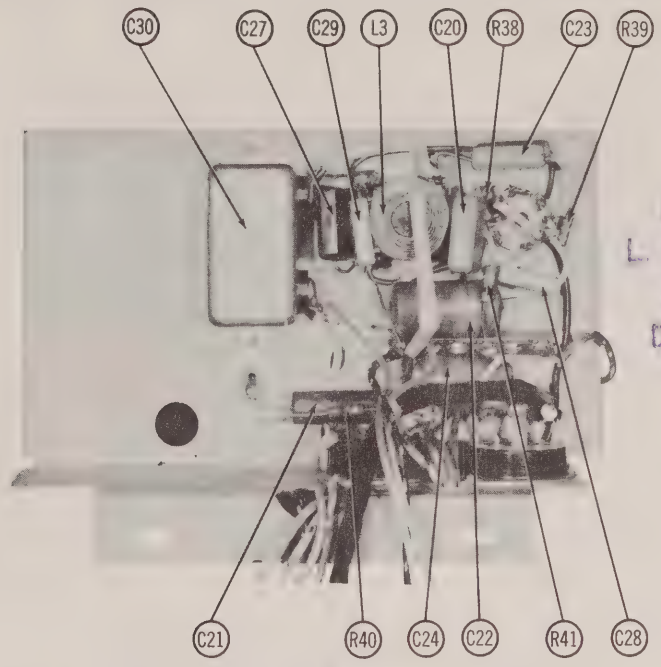

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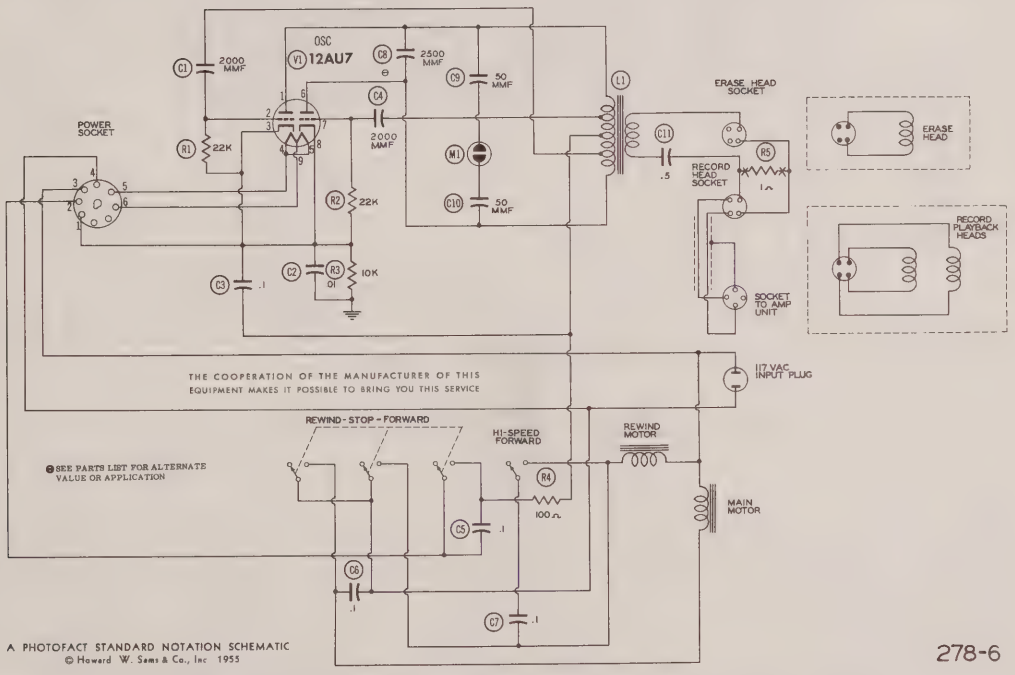
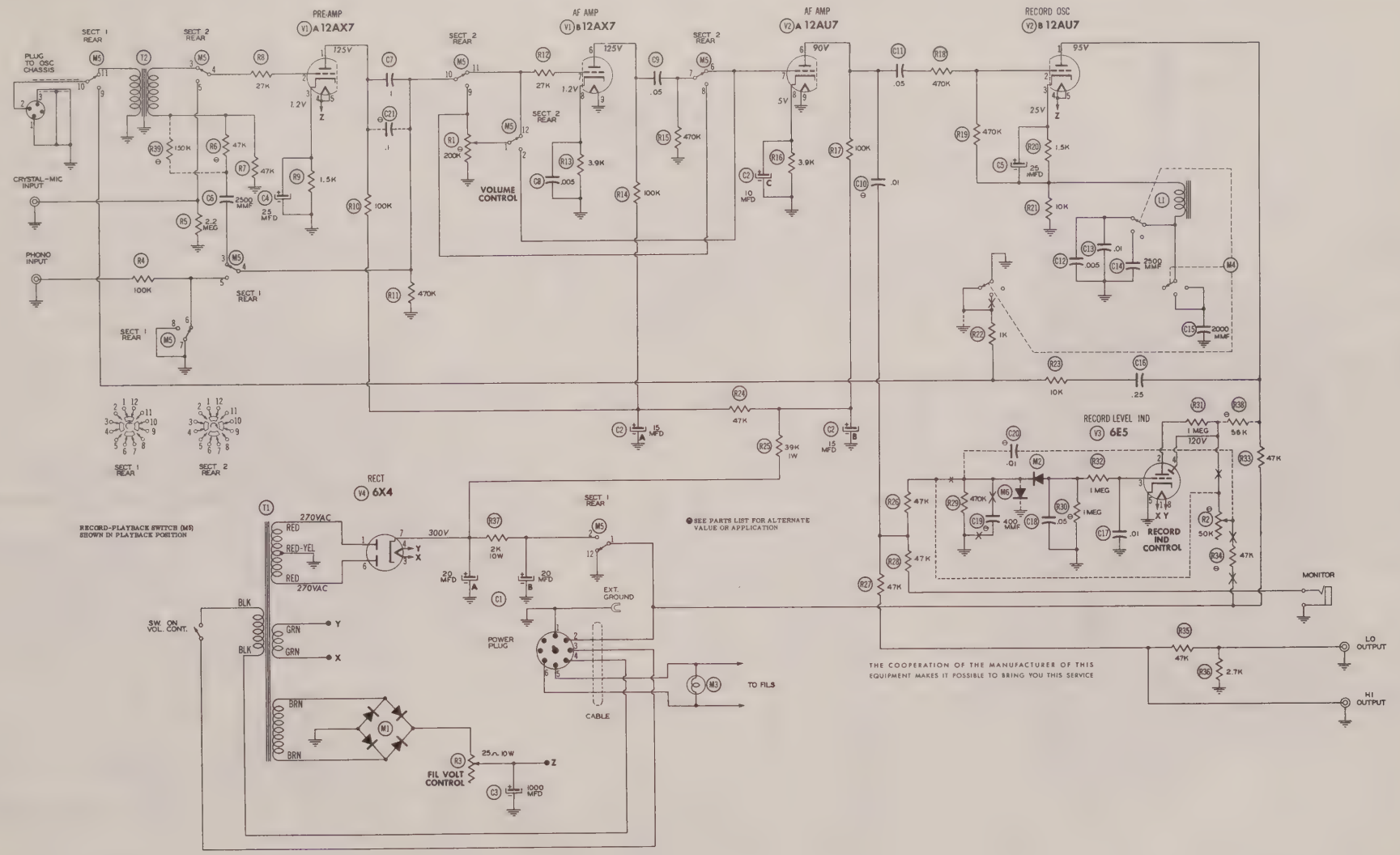
ABOVE-MODEL M30-A OSCILLATOR: BELOW-MODEL M30-A OSCILLATOR SCHEMATIC



ELECTRICAL PARTS LIST MODEL M-30A OSCILLATOR UNIT

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
V1	12AU7	Tube	C10	21X4	Cap. Mica, 50 mmf. @ 500V.
C1	21X6	Cap. Mica, 3000 mmf. @ 400V.	C11	26X8	Cap. Bathtub, .5 mfd @ 600 Volts
C2	22X6	Cap. Paper, .01 mfd. @ 400V.	R1	11X10	Resistor, 22K @ 1/2 W
C3	22X43	Cap. Paper, .1 mfd. @ 600V.	R2	11X10	Resistor, 22K @ 1/2 W
C4	21X6	Cap. Mica, 2000 mmf. @ 400V.	R3	11X2	Resistor, 10K @ 1/2 W
C5	22X43	Cap. Paper, .1 mfd. @ 600V.	R4	11X14	Resistor, 100Ω @ 1/2 W
C6	22X15	Cap. Paper, .1 mfd. @ 400V.	R5	11X29	Resistor, 1Ω @ 1/2 W (Not used in all models)
C7	22X15	Cap. Paper, .1 mfd. @ 400V.	M1		Recording Ind
C8	21X1	Cap. Mica, 2500 mmf. (some models use 2000 mmf # 21 x 6)	L1	31X6	Bias Osc. Coil
C9	21X4	Cap. Mica, 50 mmf. @ 500V.			



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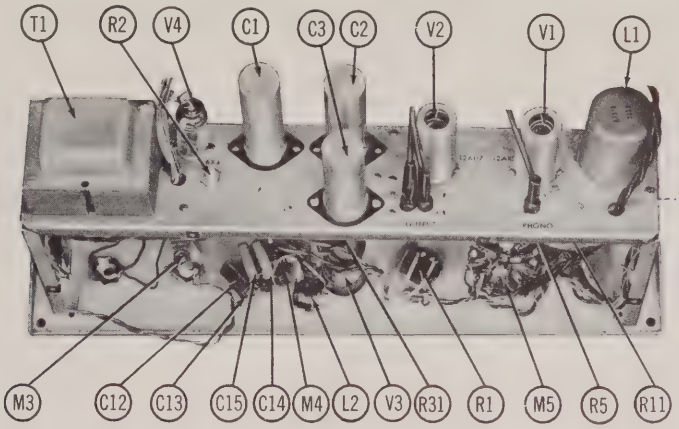
MODEL M30-G AMPLIFIER SCHEMATIC



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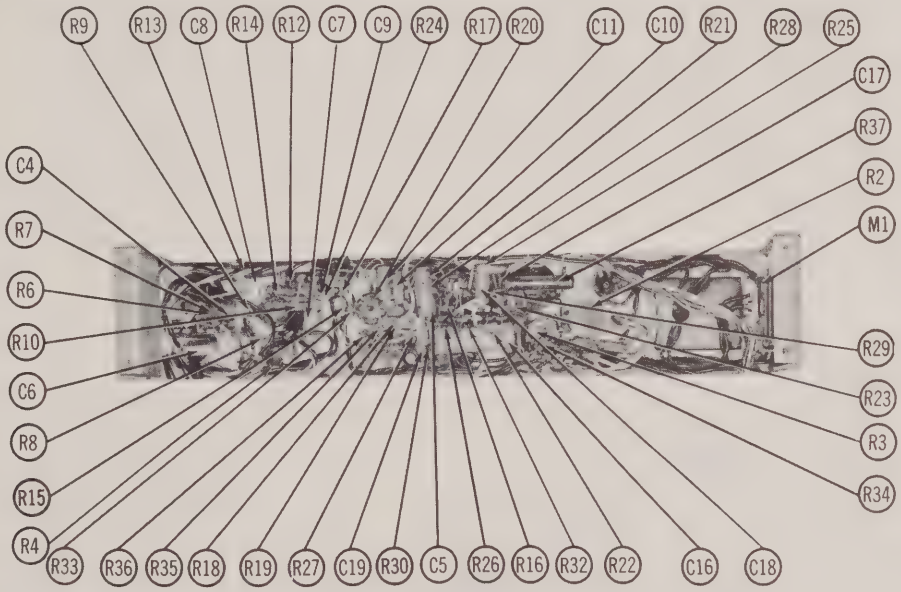
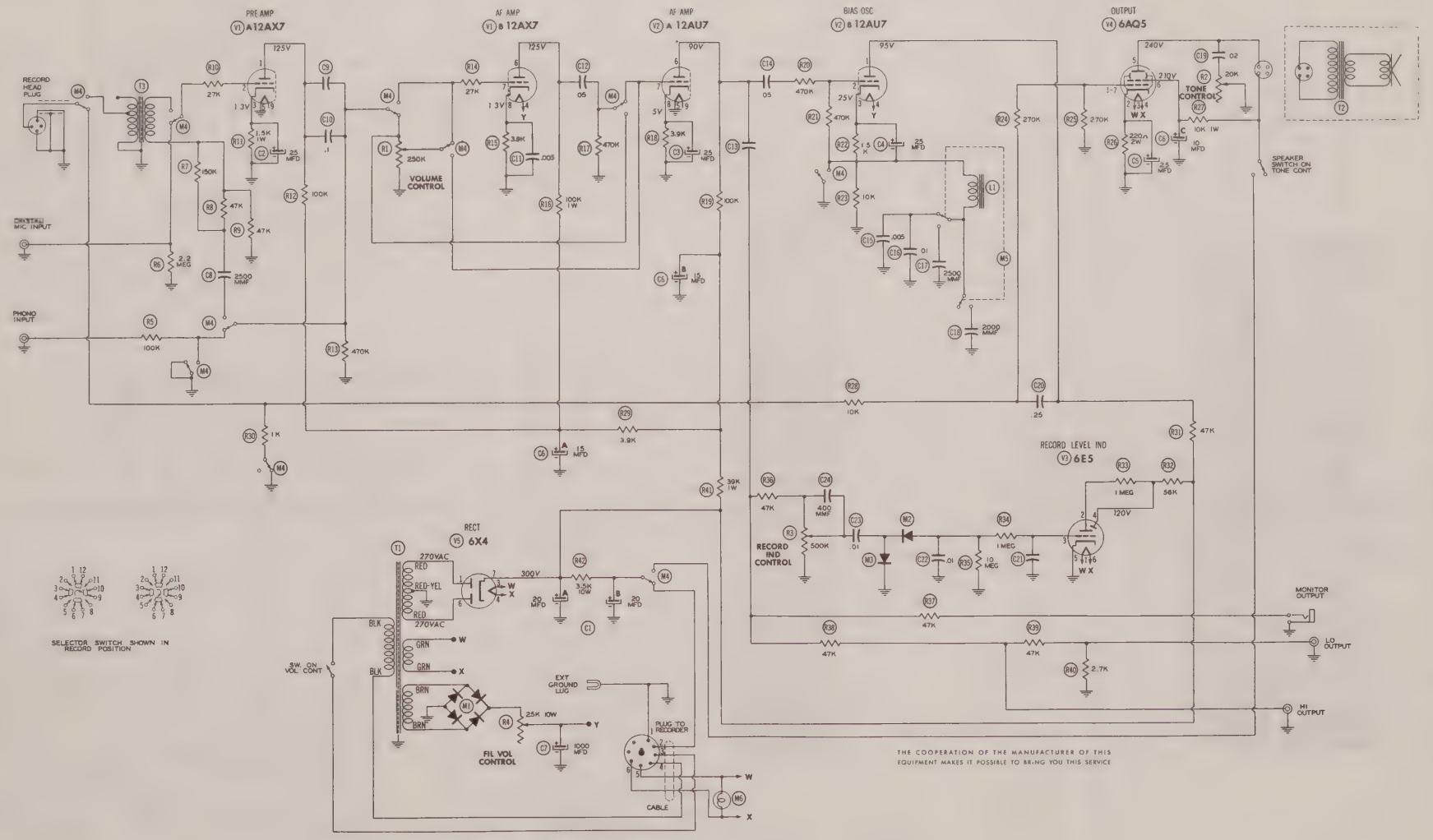
MODEL M30-G AMPLIFIER-TOP VIEW



MODEL M30-G AMPLIFIER-BOTTOM VIEW

ELECTRICAL PARTS LIST MODEL M-30G

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
V1	12AX7	12AX7, Pre-Amp., AF Amp.	C12	22X11	Cap. Paper, .005 mfd. @ 400V.
V2	12XU7	12AU7, AF Amp., Record Osc.	C13	22X6	Cap. Paper, .01 mfd. @ 400V.
V3	6E5	6E5, Record Level Ind.	C14	21X1	Cap. Mica, 2500 mmf. @400V.
V4	6X4	6X4, Rectifier	C15	21X6	Cap. Mica, 200 mmf. @ 400V.
C1A	23X7	Elect. Cap., 20 mfd. @ 450V.	C16	22X4	Cap. Paper, .25 mfd. @ 400V.
C1B		Elect. Cap., 20 mfd. @ 450V.	C17	22X6	Cap. Paper, .01 mfd. @ 400V.
C2A	23X18	Elect. Cap., 15 mfd. @ 450V.	C18	22X3	Cap. Paper, .05 mfd. @ 400V.
C2B		Elect. Cap., 15 mfd. @ 450V.	C19	21X5	Cap. Mica, 400 mmf. @ 400V.
C2C		Elect. Cap., 10 mfd. @ 450V.			(Not used in some models)
C3	23X1	Elect. Cap., 1000 mfd. @ 15V.	C20	22X6	Cap. Paper, .01 mfd. @ 400V.
C4	23X12	Elect. Cap., 25 mfd. @ 25V.			(Not used in some models)
C5	23X12	Elect. Cap., 25 mfd. @ 25V.	C21	22X15	Cap. Paper, .1 mfd @ 400V.
C6	21X1	Cap. Mica, 2500 mmf.			(Not used in some models)
C7	22X15	Cap. Paper, .1 mfd @ 400V.	R1		Vol. Control 200K (some models
C8	22X11	Cap. Paper, .005 mfd. @ 400V.			use 250K #14 x 19)
C9	22X3	Cap. Paper, .05 mfd. @ 400V.	R2		Record Ind Cont. 50 K (some
C10	22X6	Cap. Paper, .01 mfd. @ 400V.			models use 500K # 14 x 33)
		(some models use .1 mfd @ 400V	R3		Fil. Volt Cont. 25Ω @ 10W
		22 x15)	R4	11X9	Resistor 100K @ 1/2 W
C11	22X3	Cap. Paper, .05 mfd. @ 400V.	R5	11X5	Resistor 2.2 Meg @ 1/2 W



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278-6

MODEL M33-G AMPLIFIER SCHEMATIC

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ELECTRICAL PARTS LIST (Cont.)

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
R6	11X17	Resistor 47K @ 1/2 W (some models use 150 K # 11 x 7)	R30	11X44	Resistor 1 Meg @ 1/2 W (some models use 10 Meg # 11 x 15)
R7	11X17	Resistor 47K @ 1/2 W	R31	11X44	Resistor 1 Meg @ 1/2 W
R8	11X12	Resistor 47K @ 1/2 W	R32	11X44	Resistor 1 Meg @ 1/2 W
R9	11X3	Resistor 1.5 K @ 1/2 W	R33	11X17	Resistor 47K @ 1/2 W
R10	11X67	Resistor 100K @ 1/2 W	R34	11X17	Resistor 47K @ 1/2 W (Not used in some models)
R11	11X4	Resistor 470K @ 1/2 W			
R12	11X12	Resistor 27K @ 1/2 W	R35	11X17	Resistor 47K @1/2 W
R13	11X8	Resistor 3.9K @ 1/2 W	R36	11X16	Resistor 2.7K @ 1/2 W
R14	11X67	Resistor 100K @ 1/2 W	R37	12X4	Resistor 2K @ 10W
R15	11X4	Resistor 470K @ 1/2 W	R38	11X126	Resistor 56K @ 1/2 W (Not used in some models)
R16	11X8	Resistor 3.9K @ 1/2 W			
R17	11X67	Resistor 100K @ 1/2 W	R39	11X7	Resistor 150K @ 1/2 W (Not used in some models)
R18	11X4	Resistor 470K @ 1/2 W			
R19	11X4	Resistor 470K @ 1/2 W	T1	32B5	Power Transformer
R20	11X3	Resistor 1.5K @ 1/2 W	T2	32B8	Input Transformer
R21	11X2	Resistor 10K @ 1/2 W	L1	31X9	Equalizer Coil
R22	11X99	Resistor 1K @ 1/2 W	M1	42X6	Selenium Rect. (4 used)
R23	11X2	Resistor 10K @ 1/2 W	M2	84X1	Selenium Diode
R24	11X17	Resistor 47K @ 1/2 W	M3	41X29	Pilot Lamp Assy.
R25	11X18	Resistor 39K @ 1/2 W	M4	43A7	Equalizer Switch
R26	11X17	Resistor 47K @ 1/2 W	M5	43X13	Play-Record Switch
R27	11X17	Resistor 47K @ 1/2 W	M6	84X1	Selenium Diode (Not used in some models)
R28	11X17	Resistor 47K @ 1/2 W			
R29	11X4	Resistor 470K @ 1/2 W			

ELECTRICAL PARTS LIST MODEL M-33G

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
V1	12AX7	12AX7, Pre-Amp., AF Amp.	R5	11X9	Resistor, 100KΩ, 1/2 W.
V2	12AU7	12AU7, AF Amp., Bias Osc.	R6	11X5	Resistor, 2.2 Meg., 1/2 W.
V3	6E5	6E5, Record Level Ind.	R7	11X7	Resistor, 150KΩ, 1/2 W.
V4	6AQ5	6AQ5, Audio Output	R8	11X17	Resistor, 47KΩ, 1/2 W.
V5	6X4	6X4, Rectifier	R9	11X17	Resistor, 47KΩ, 1/2 W.
C1A	23X7	Cap., Elect., 20 mfd. @ 450V.	R10	11X12	Resistor, 27KΩ, 1/2 W.
C1B		Cap., Elect., 20 mfd. @ 450V.	R11	11X3	Resistor, 1.5KΩ, 1/2 W.
C2	23X12	Cap., Elect., 25 mfd. @ 25V.	R12	11X67	Resistor, 100KΩ, 1 W.
C3	23X12	Cap., Elect., 25 mfd. @ 25V.	R13	11X4	Resistor, 470KΩ, 1/2 W.
C4	23X12	Cap., Elect., 25 mfd. @ 25V.	R14	11X12	Resistor, 27KΩ, 1/2 W.
C5	23X12	Cap., Elect., 25 mfd. @ 25V.	R15	11X8	Resistor, 3.9KΩ, 1/2 W.
C6A	23X18	Cap., Elect., 15 mfd. @ 450V.	R16	11X67	Resistor, 100KΩ, 1 W.
C6B		Cap., Elect., 15 mfd. @ 450V.	R17	11X4	Resistor, 470KΩ, 1/2 W.
C6C		Cap., Elect., 10 mfd. @ 450V.	R18	11X8	Resistor, 3.9KΩ, 1/2 W.
C7	23X1	Cap., Elect., 1000 mfd. @ 15V.	R19	11X9	Resistor, 100KΩ, 1/2 W.
C8	21X1	Cap., Mica, 2500 mmf.	R20	11X4	Resistor, 470KΩ, 1/2 W.
C9	22X15	Cap., Paper, .1 mfd. @ 400V.	R21	11X4	Resistor, 470K, 1/2 W.
C10	22X15	Cap., Paper, .1 mfd. @ 400V.	R22	11X3	Resistor, 1.5KΩ, 1/2 W.
C11	22X11	Cap., Paper, .005 mfd. @400V.	R23	11X2	Resistor, 10KΩ, 1/2 W.
C12	22X3	Cap., Paper, .05 mfd. @ 400V.	R24	11X6	Resistor, 270KΩ, 1/2 W.
C13	22X15	Cap., Paper, .1 mfd. @ 400V.	R25	11X6	Resistor, 270KΩ, 1/2 W.
C14	22X3	Cap., Paper, .05 mfd. @ 400V.	R26	11X129	Resistor, 220Ω, 2 W.
C15	22X11	Cap., Paper, .005 mfd. @400V.	R27	11X90	Resistor, 10KΩ, 1 W.
C16	22X6	Cap., Paper, .01 mfd. @ 400V.	R28	11X2	Resistor, 10KΩ, 1/2 W.
C17	21X1	Cap., Mica, 2500 mmf.	R29	11X17	Resistor, 3.9K, 1/2 W.
C18	21X6	Cap., Mica, 2000 mmf.	R30	11X99	Resistor, 1KΩ, 1/2 W.
C19	22X42	Cap., Paper, .02 mfd. @ 400V.	R31	11X17	Resistor, 47KΩ, 1/2 W.
C20	22X4	Cap., Paper, .25 mfd. @ 400V.	R32	11X126	Resistor, 56KΩ, 1/2 W.
C21	22X6	Cap., Paper, .01 mfd. @ 400V.	R33	11X44	Resistor, 1 Meg., 1/2 W.
C23	22X6	Cap., Paper, .01 mfd. @ 400V.	R34	11X44	Resistor, 1 Meg., 1/2 W.
C24	21X5	Cap., Mica, 400 mmf.	R35	11X15	Resistor, 10 Meg., 1/2 W.
R1	14X19	Volume Cont. & Switch, 250KΩ	R36	11X17	Resistor, 47KΩ, 1/2 W.
R2	14X23	Tone Control, 20KΩ	R37	11X17	Resistor, 47KΩ, 1/2 W.
R3	14X33	Record Ind. Adj. Cont., 500KΩ	R38	11X17	Resistor, 47KΩ, 1/2 W.
R4	12X20	Fil. Voltage Cont., 25KΩ, 10 Watt	R39	11X17	Resistor, 47KΩ, 1/2 W.

ELECTRICAL PARTS LIST (Cont.)

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
R40	11X16	Resistor, 2.7KΩ, 1/2 W.	M1	42X6	Selenium Rect.
R41	11X18	Resistor, 39KΩ, 1 W.	M2	84X1	Selenium Diode (Type 101)
R42		Resistor, 3.5KΩ, 10 W.	M3	84X1	Selenium Diode (Type 101)
T1	32B27	Power Trans.	M4	43X13	Record-Playback Switch
T2	33X10	Output Trans. & Spkr. Assy.	M5	43A7	Equalization Switch
T3	32B8	Input Trans.	M6	41X23	Pilot Lamp
L1	31X9	Equalizer Coil			

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	91A5	Reel Retainer	44	87X22	Control Knob
2	91A82	Rewind Flange Assembly	45	91A918	Short Spacer with Rubber Bumper
3	71D426	Front Panel	46	75A282	Long Spacer
4	614B5	Roller Mounting Screw, #4-40 x 5/16	47	75A283	Spacer
			48	35C20	Rewind Motor
5	63A5	Guide Roller Washer, Aluminum	49	72B169	Pawl Mounting Bracket
6	91A49	Guide Roller, Flat	50	75A283	Spacer
6A	91A10	Guide Roller, Flanged	51	91A729	Pawl and Plate Assembly
7	76A8	Guide Roller Shaft	52	91A43	Rewind Hub Assembly
8	75A11	Guide Roller Spacer	53		Screw, Pawl Mounting Bracket
9	91X1242	Erase Head	54	63A9	Felt Washer
10	77A25	Head Adjusting Spring	55	74A70	Bearing, Ratchet
11	91A18	Head Shield	56	75A86	Rewind Ratchet
12	2FL12	#2-56 x 3/4 F. H. M. S.	57	77A2	Spring, Pawl Rewind
13	91X1237	Play-Record Head, Half Track	58	63A9	Felt Washer
14	14K5	Knurled Pressure Roller Screw	59	63A10	Brass Washer
14A	14K6	Knurled Capstan Screw	60	63A11	Sponge Rubber Washer
15	91A14	Pressure Roller, 3 3/4"	61	91A70	Lock Nut
	91A15	Pressure Roller, 7 1/2"	62		Fast Forward Shaft & Control Arm
	75A16	Capstan, 3 3/4"	63	78A12	Fast Forward Link, Long
	75A15	Capstan, 7 1/2"	64	91A1244	Drive Arm & Plate Assembly
16	87X23	Fast Forward Control Knob	65	91A927	Drive Wheel, 2-inch
17	75A37	Control Sleeve	66	77A4	Drive Wheel Spring
18	91A51	Take-Up Shaft and Hub Assembly	67	67A12	Hairpin Retainer
19	91A52	Take-Up Housing Assembly	68	91A130	Take-Up Wheel
20	91A36	Take-Up Hub Assembly	69	71D4D	Back Panel
21	63A9	Felt Washer, White	70	91A1244	Drive Arm & Plate Assembly
22	91A38	Take-Up Wheel	71	628CL	Nut, Elastic Stop
23	63A9	Felt Washer, White	72		Flat Washer
24	63A10	Washer, Brass	73	77A55	Spring, Rewind
25	63A11	Washer, Sponge	74	78A130	Catch, Link
26	91A70	Lock Nut	75	77A56	Spring, Link
27		Adjusting Screw	76	77A4	Take-Up Wheel Spring
28		Lock Washer	77	91A1229	Take-Up Arm & Plate Assembly
29		Hex. Nut	78		Take-Up Arm Adj. Screw
30	74A12	Capstan Shaft Bearing	79		Fast Forward Lever
31	78A22	Bearing Retainer	80	91A217	Fast Forward Lever Mtg. Bracket
31A	63A8	Bearing Oil Retainer Washer	81	78A13	Link, Fast Forward Shaft
32	91A213	Pressure Arm Shaft Assembly	82	67X13	1/4" Tru Arc Retainer
33	91A1228	Flywheel Assembly	83	77A35	Fast Forward Spring
33A	63X98	Bronze Washer	84	91A217	Fast Forward Mounting Bracket
34	78X28	Ball Thrust Bearing	85		Fast Forward Adj. Screws
35	78A22	Bearing Retainer	86	91A86	Fast Forward Wheel
36	91A1060	Fast Forward Micro Switch	87	74B41	R. H. Side Panel
37	74A12	Bearing, Rear, Oilite	88	77A4	Drive Wheel Spring
38	63A8	Bearing Oil Retainer Washer	89	35C40	Drive Motor
39	67X13	1/4" Tru Arc Retainer	90	91A1582	Thrust Adj. Screw & Nut Assy.
40	91A32	Switch and Cam Shaft	91	43X14	Rewind Switch
40A	78A102	Actuator Arm	92	43X14	Forward Switch
41	77A1	Handle Spring	93	75A30	Thrust Bearing Housing
42	91A31	Safety Shaft	94	91A30	Switch Arm & Pin
43	77A6	Pressure Arm Spring			

PHOTOFACT* Folder

MOTOROLA MODELS 21C3, B, 21K21, B, 21K22, 21K23, B, 21K24, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K21, B, Y21K22, Y21K23, B, Y21K24, Y21T19, B, Y24K4, B, Y24K5, B (Ch. TS-528, Y, TS-603, Y)

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MODEL 24K4

MOTOROLA MODELS 21C3, B, 21K21, B, 21K22, 21K23, B, 21K24, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K21, B, Y21K22, Y21K23, B, Y21K24, Y21T19, B, Y24K4, B, Y24K5, B (Ch. TS-528, Y, TS-603, Y)

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MOTOROLA MODELS 21C3, B, 21K21, B, 21K22, 21K23, B, 21K24, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K21, B, Y21K22, Y21K23, B, Y21K24, Y21T19, B, Y24K4, B, Y24K5, B (Ch. TS-528, Y, TS-603, Y)

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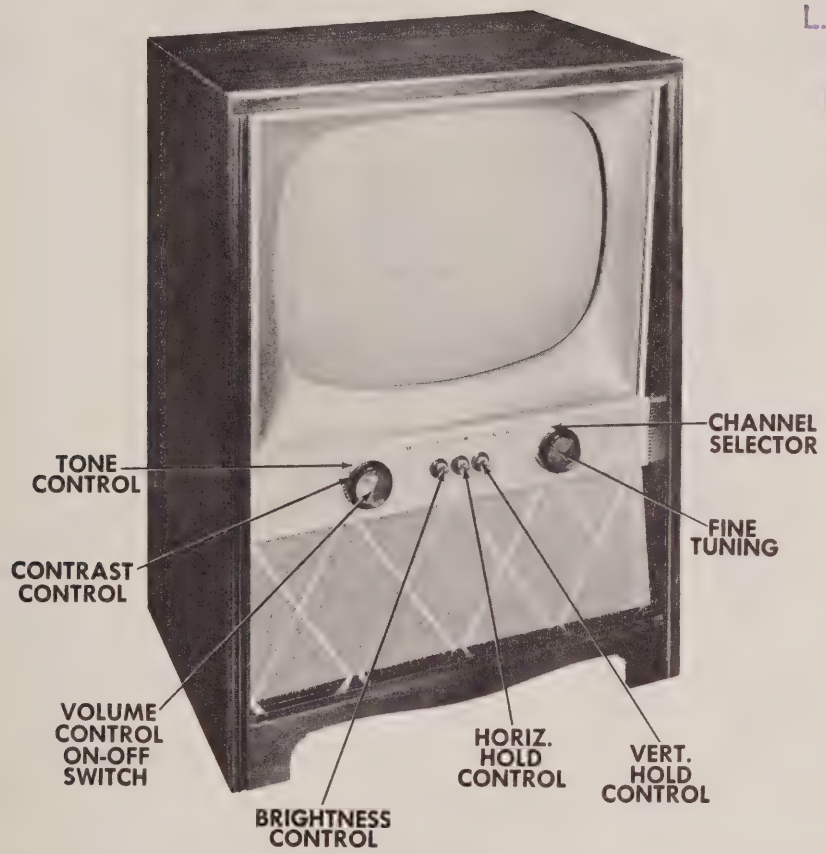

MOTOROLA MODEL 24K4

TRADE NAME	Motorola	MODELS	CHASSIS	TUNER VHF	TUNER UHF
		21C3, 21C3B, 21K21, 21K21B, 21K22, 21K23, 21K23B, 21K24, 21T19, 21T19B	TS-528	TT-70	
		Y21C3, Y21C3B, Y21K21, Y21K21B, Y21K22, Y21K23, Y21K23B, Y21K24, Y21T19, Y21T19B	TS-528Y	TT-70Y	WTT-37
		24K4, 24K4B, 24K5, 24K5B	TS-603	TT-70	
		Y24K4, Y24K4B, Y24K5, Y24K5B	TS-603Y	TT-70Y	WTT-37

MANUFACTURER	Motorola Inc., 4545 Augusta Blvd., Chicago, Ill.
TYPE SET	Television Receiver
TUBES	Nineteen
POWER SUPPLY	110-120 Volts AC - 60 Cycle RATING 1.4 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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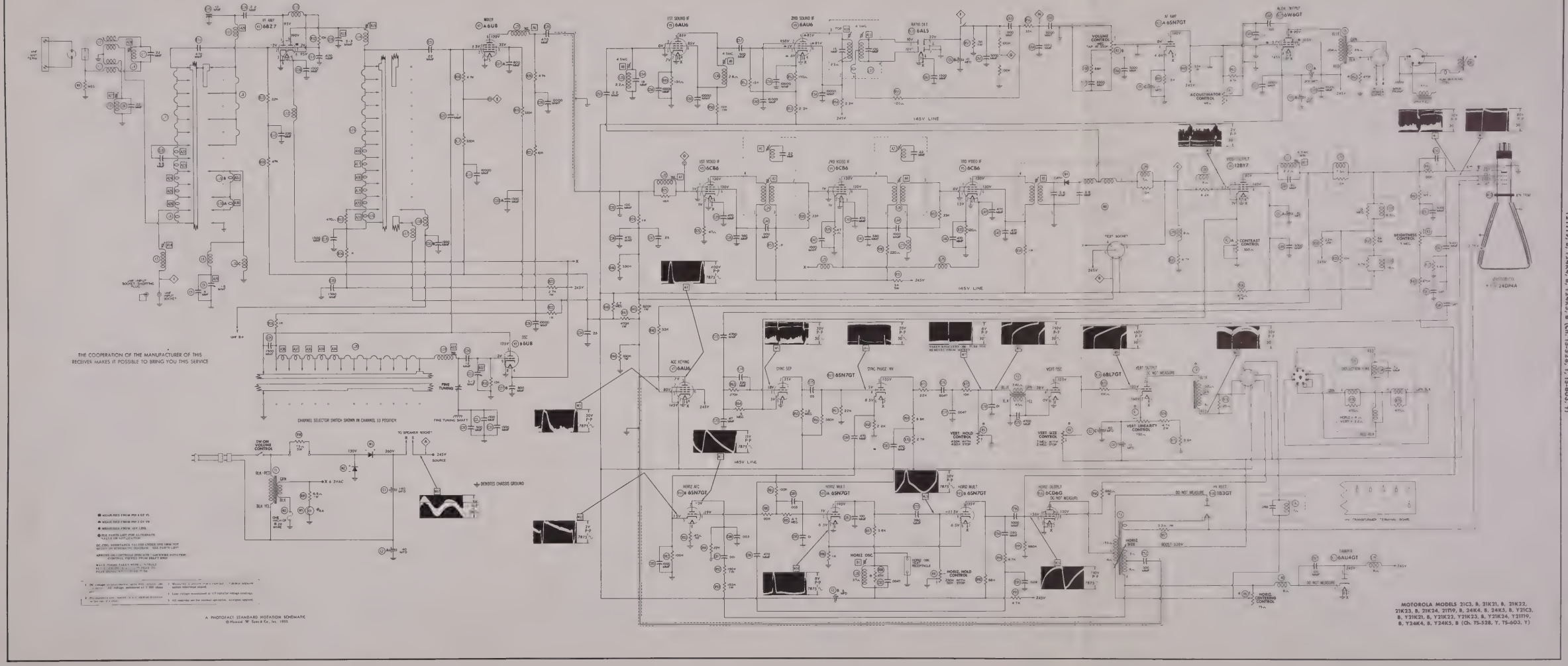
MOTOROLA MODELS 21C3, B, 21K21, B, 21K22, 21K23, B, 21K24, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K21, B, Y21K22, Y21K23, B, Y21K24, Y21T19, B, Y24K4, B, Y24K5, B (Ch. TS-528, Y, TS-603, Y)



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MOTOROLA MODELS 21C3, B, 21K21, B, 21K22, 21K23, B, 21K24, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K21, B, Y21K22, Y21K23, B, Y21K24, Y21T19, B, Y24K4, B, Y24K5, B (Ch. TS-528, Y, TS-603, Y)

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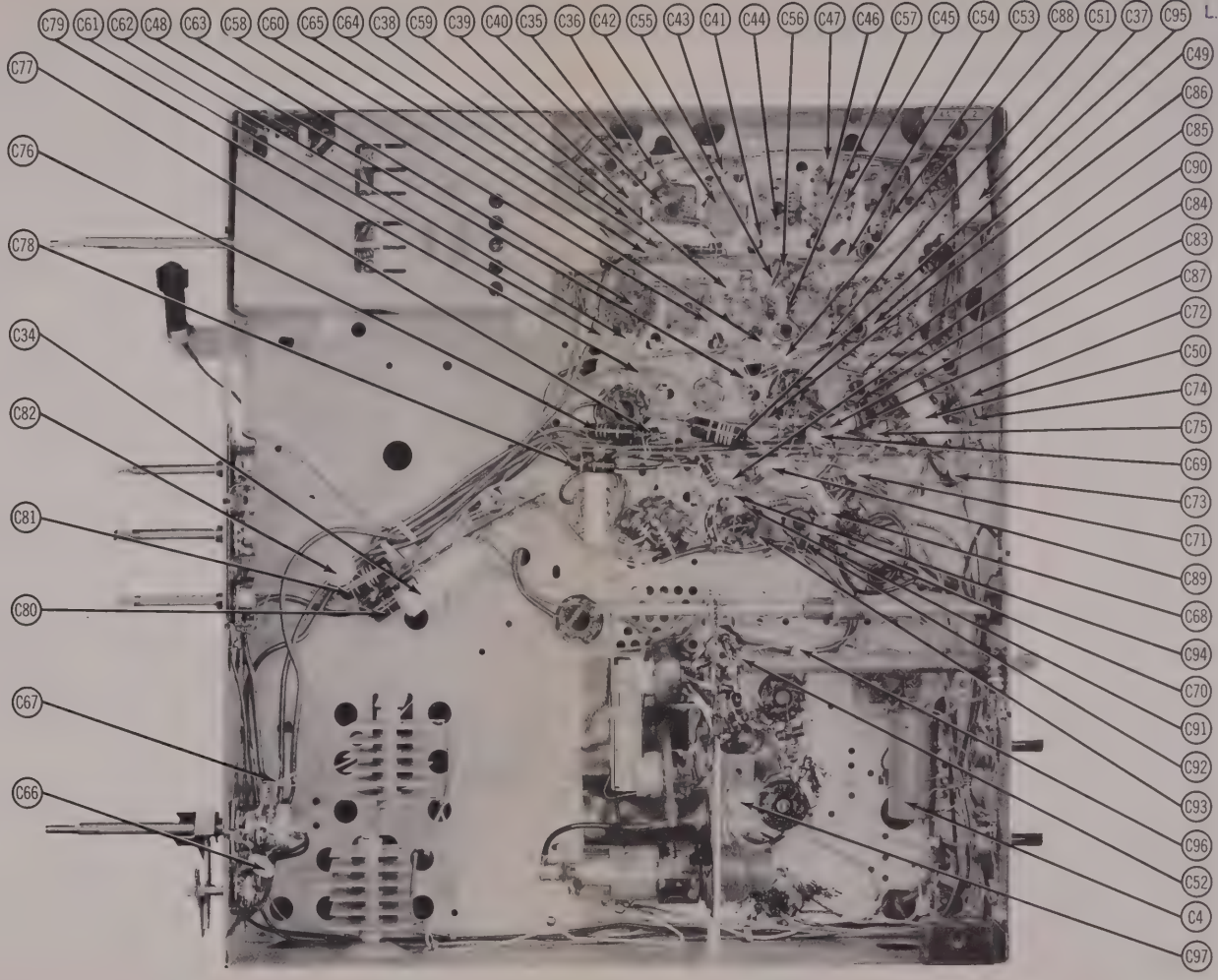

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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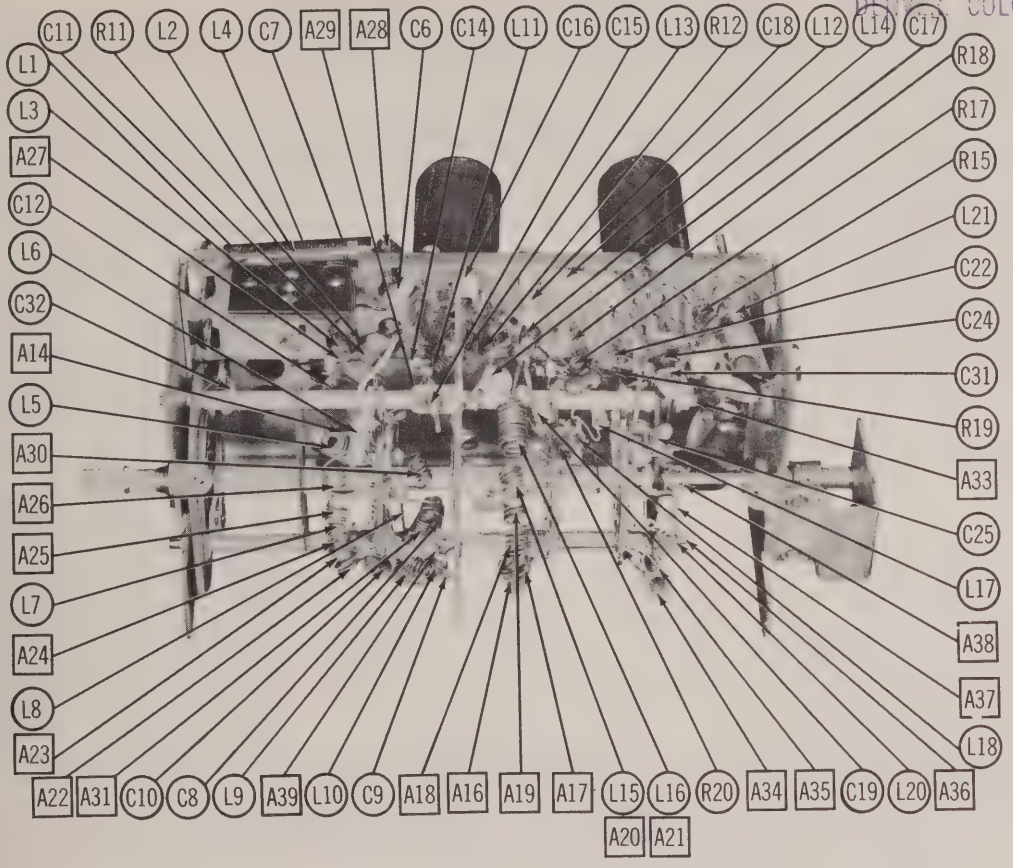
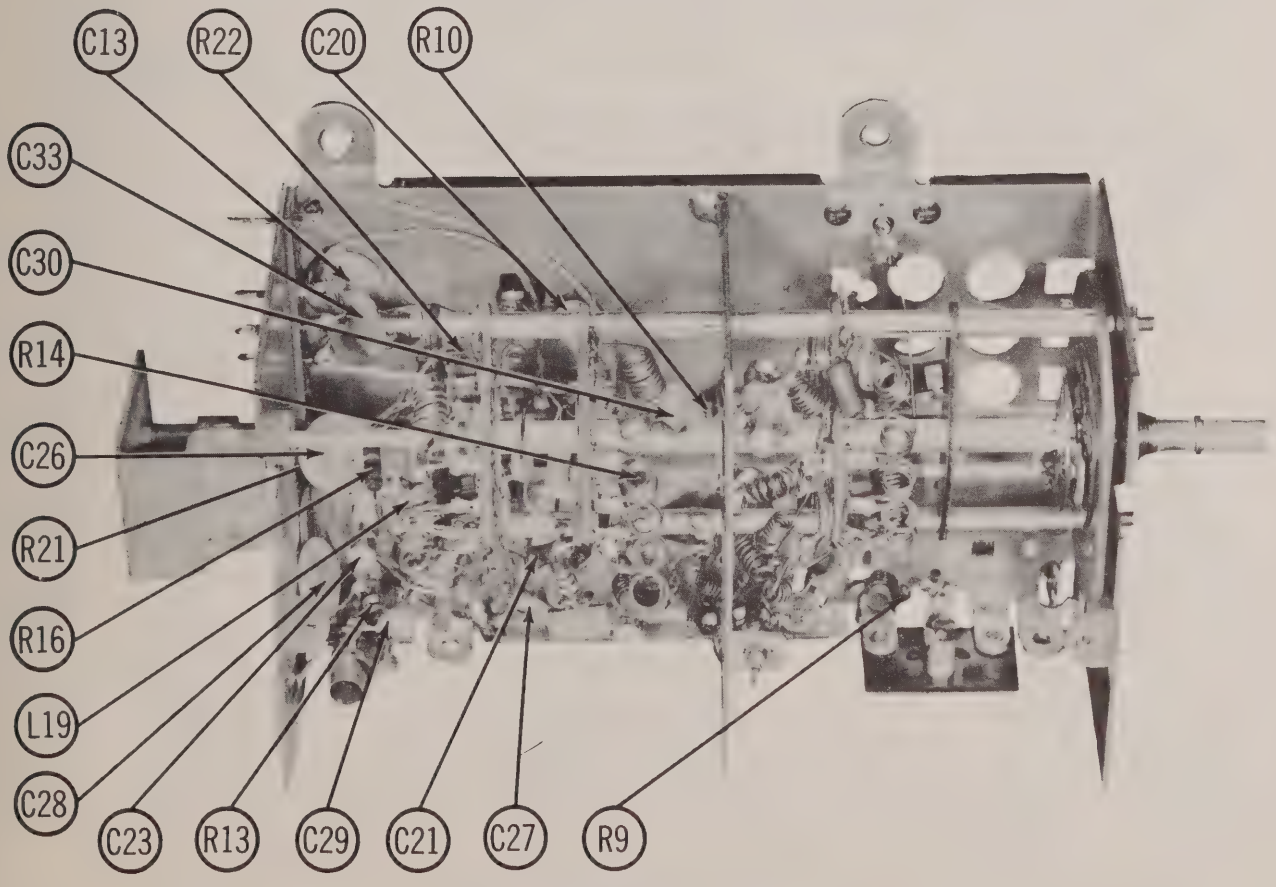


RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use an isolation transformer to protect the test equipment.
Remove the horizontal output tube (V16) from its socket to eliminate the high voltage shock hazard.
Connect a 2500Ω, 10 watt resistor from point Ⓐ to chassis.

VIDEO IF ALIGNMENT

Disable the local oscillator by shorting pin 9 (grid) of 6U8 (V2) to chassis with short lead.
If sweep generator has no built-in markers, loosely couple the output of an accurately calibrated AM generator to the video IF strip. If IF coils and traps have two points of resonance, the correct settings are with the cores away from the center of the coil form so as not to effect coupling between coil and trap windings.
Connect the negative side of a 6 volt battery to point Ⓑ . Positive lead to chassis.
Attenuate sweep generator to maintain 3 to 5 volts peak to peak on scope at point Ⓒ .
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side to point Ⓓ . Low side to chassis. Use very short leads.	44MC (10MC Swp)	41.25MC	13	Vert. Amp. thru 47KΩ to point Ⓒ . Low side to chassis.	A1	Adjust so that trap notch falls at 41.25MC. Use sufficient generator output so that trap notch is clearly defined (Fig. 1).
2.	"	"	"	47.25MC	"	"	A2	Adjust so that notch falls at 47.25MC. Temporarily remove the -6 volt bias to provide better trap notch definition (Fig.1).
3.	"	"	"	42.25MC	"	"	A3	Adjust to place 42.75MC marker at 55% on response curve (Fig. 1).
4.	"	"	"	45.75MC	"	"	A4, A5	Adjust A4 to place 45.75MC marker at 65% on high side of response curve. Simultaneously adjust A5 for flat-top and symetrical response similar to Fig. 1.
5.	"	High side to point Ⓔ . Low side to chassis. Use very short leads.	"	41.25MC 42.25MC 45.25MC 47.25MC	"	"	A6, A7	Simultaneously adjust A6 and A7 for response similar to Fig. 2. A6 positions curve and A7 has leveling effect. To check 41.25MC and 47.25MC trap attenuation connect DC probe of VTVM to point C . Common to chassis. Take readings with marker generator set to 41.25MC, 44.0MC and 47.25MC. The voltage ratio between 41.25MC and 44MC should be between 30 and 65 and the voltage ratio between 47.25MC and 44.0MC should be between 100 and 200.

REGENERATION CHECK

Leave pin 9 of V2 shorted to chassis and remove 6 volt bias supply. With generator and scope connected as in step 5 observe response curve. Any regeneration will be indicated by sharp peaks on response curve.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect the two matched 100KΩ (±1%) resistors in series from point Ⓕ to chassis. The junction of these two resistors is alignment point Ⓖ as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
6.	Direct	High side to point Ⓒ . Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe thru 10KΩ to point Ⓕ . Common to chassis.	A8, A9, A10	Adjust for maximum deflection.
7.	"	"	"	"	DC probe to point Ⓗ . Common to point Ⓖ .	All	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. For best accuracy repeat steps 6 and 7.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120Ω sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Direct	High side to point Ⓒ Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any non-interfering channel	Vert. Amp. thru 10KΩ to point Ⓕ . Low side to chassis.	A8, A9, A10	Disconnect stabilizing capacitor C5B. Adjust for curve of maximum amplitude and symmetry similar to Fig. 3.
7.	"	"	"	"	"	Vert. Amp. to point Ⓗ . Low side to chassis.	All	Reconnect stabilizing capacitor C5B. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 4. SLIGHTLY retouch A10 for maximum amplitude and straightness of crossover lines.

SOUND IF ALIGNMENT USING TV SIGNAL AND VTVM

Tune in a TV station. Connect VTVM to point Ⓕ and maintain approximately 5 volts at VTVM by adjusting fine tuning.
Adjust A8, A9 and A10 for maximum deflection on meter. Then connect VTVM to point Ⓗ and adjust All for a reading of approximately 2.5 volts on VTVM or one-half the reading of VTVM on above adjustment.

4.5MC TRAP ALIGNMENT

Set contrast control full clockwise.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	Direct	High side to point Ⓒ . Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe thru detector (Fig. 5) to pin 11 of picture tube. Common to chassis.	A12	Adjust for MINIMUM deflection.

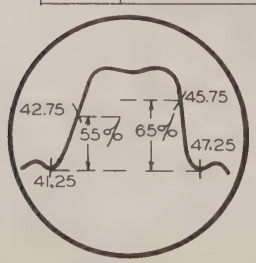


FIG.1

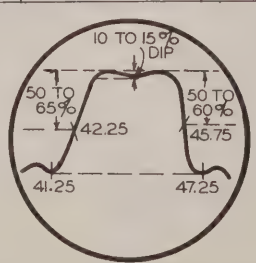


FIG. 2

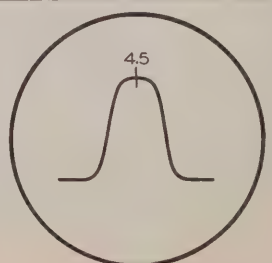


FIG. 3

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ALIGNMENT INSTRUCTIONS (cont)

ALTERNATE 4.5MC TRAP ALIGNMENT

Tune in a TV station preferably with a test pattern. Adjust A12 for MINIMUM 4.5MC interference in picture by locating the two points at which the beat is just noticed and adjust A12 at the center position of these two points.

RF AND MIXER ALIGNMENT

Remove 6 volts AGC used in IF alignment. Ground AGC line to tuner by shorting C34 to chassis with clip lead.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Preset A14 and A28 full into coil. Preset A15 midway into coil. Remove tuner shield. RF and antenna coils with no iron core are adjusted by compressing or expanding coil turns.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	177MC (10MC Swp)	175.25MC 179.75MC	7	Vert. Amp. thru 47KΩ to point (E). Low side to chassis.	A13, A14	Adjust A13 so that sound and video markers fall within limits shown in Fig. 6. Adjust A14 until side of channel 7 is affected, then back off A14 until it drops out of the response curve.
10.	"	"	213MC (10MC Swp)	211.25MC 215.75MC	13	"	A15, A29	Adjust for maximum amplitude and for response curve similar to Fig. 6. Be sure markers fall within limits as shown. If necessary retouch A13.
11.	"	"	207MC (10MC Swp)	205.25MC 209.75MC	12	"		Check for response curve similar to Fig. 6. Be sure markers fall within limits as shown on response curve. If necessary repeat steps 9 and A10.
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			195MC (10MC Swp)	193.25MC 197.75MC	10			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
12.	"	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A16, A22	Adjust A16 by compressing or expanding coil turns to obtain response similar to Fig. 7. Usually the antenna coils A22 thru A26 are not to be adjusted. If they have been distorted they may be adjusted by expanding or compressing coil turns for maximum response in conjunction with the RF coils A16 thru A21. If it is necessary to adjust any antenna coil in following steps, then A14 coil adjustment must be repeated as in step 9.
13.	"	"	"	"	"	"	A27	Adjust FM trap core, A27 until a SLIGHT effect is noted on sound side of response curve (Fig. 7).
14.	"	"	79MC (10MC Swp)	77.25MC 81.75MC	5	"	A17, A23	Adjust A17 by compressing or expanding coil turns for response similar to Fig. 7. For A23 see remarks in step 12.
15.	"	"	69MC (10MC Swp)	67.25MC 71.75MC	4	"	A18, A24	Adjust A18 for response similar to Fig. 7 For A24 see remarks in step 12.
16.	"	"	63MC (10MC Swp)	61.25MC 65.75MC	3	"	A19, A25	Adjust A19 for response similar to Fig. 7. For A25 see remarks in step 12.
17.	"	"	57MC (10MC Swp)	55.25MC 59.75MC	2	"	A20, A26	Adjust for response similar to Fig. 7. For A26 see remarks step 12. Replace tuner shield and check channel 13 thru 2. Response on channels 13 thru 7 must be within limits shown in Fig. 6. Response on channels 6 thru 2 must be similar to Fig. 7. If low freq. response needs improving SLIGHTLY adjust A30 and A31 by compressing or expanding coils for best results.
18.	Direct	High side to point (I). Low side to chassis.	44MC (10MC Swp)	42.25MC 46.75MC	UHF	"	A21	Remove tuner shield. Adjust A21 by compressing or expanding coil for response curve similar to Fig. 7. Replace tuner shield.

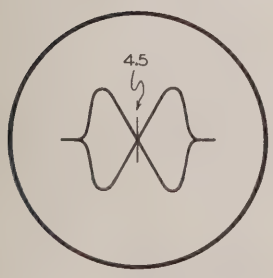


FIG. 4

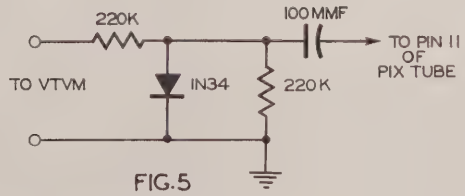


FIG. 5

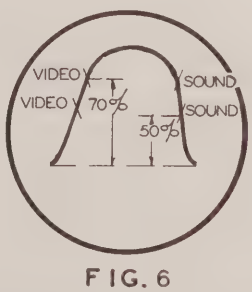


FIG. 6

MOTOROLA MODELS 21C3, B, 21K21, B, 21K22, 21K23, B, 21K24, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K21, B, Y21K22, Y21K23, B, Y21K24, Y21T19, B, Y24K4, B, Y24K5, B (Ch. TS-528, Y, TS-603, Y)

ALIGNMENT INSTRUCTIONS (cont)

OSCILLATOR ALIGNMENT

Remove shorting jumper from C34 AGC capacitor.
Replace bias supply as under "Video IF Alignment".
Use only enough sweep generator output to produce usable pattern on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range. (See Fig. 8).

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
19.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	195MC (10MC Swp)	193.25MC 197.75MC	10	Vert. Amp. thru 47KΩ to point Ⓒ. Low side to chassis.	A32	Adjust to place sound marker SLIGHTLY higher in frequency than the sound trap notch. This allowance must be made due to removal of tuner shield. With shield replaced the sound marker should move down into the trap notch. Check channels 7 thru 13 noting whether sound marker for each channel falls just above the trap notch. Response should be similar to Fig. 9. If more than 30 degrees rotation of fine tuning control is necessary to place sound marker in proper position on any high band adjust A33. If A33 is adjusted it may be necessary to readjust A32 on channel 10.
			213MC (10MC Swp)	211.25MC 215.75MC	13			
			207MC (10MC Swp)	205.25MC 209.75MC	12			
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
20.	"	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A34	Check to see that fine tuning is at midway capacity as in Fig. 6. Adjust A34 by compressing or expanding coil to place sound marker just above trap notch as in Fig. 9.
21.	"	"	79MC (10MC Swp)	77.25MC 81.75MC	5	"	A35	Adjust by compressing or expanding coil to place sound marker just above trap notch (Fig. 9) with fine tuning within 15 degrees of position shown in Fig. 8.
			69MC (10MC Swp)	67.25MC 71.75MC	4		A36	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A37	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A38	

CHANNEL 7 INTO 6 INTERFERENCE TRAP AND IF TRAP ALIGNMENT

Same instructions as for "Oscillator Alignment".

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
22.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	85MC (10MC Swp)	83.25MC 87.75MC	6	Vert. Amp. thru 47KΩ to point Ⓒ. Low side to chassis.	A39	Set fine tuning so that sound marker falls into trap notch. Increase sweep generator output to produce visible response on scope. Adjust channel 7 into 6 trap adjustment A39 for MINIMUM response.
23.	"	"	44.5MC (10MC Swp)	41.25MC 44.5MC 45.75MC	2	"	A28	Increase sweep generator output to produce visible response on scope. Adjust A28 for MINIMUM response similar to Fig. 10.

IF SENSITIVITY MEASUREMENT

Remove horizontal output tube (V16), and connect a 2500Ω, 10 watt resistor from point Ⓐ to chassis. Disable the local oscillator by shorting pin 9 (grid) of 6U8 (V2) to chassis with short lead.
Short out AGC by a clip lead at point Ⓑ to chassis.
Contrast control fully counter clockwise. Connect high side of AM signal generator to point Ⓓ. Low side to chassis.
Connect the DC probe of VTVM to point Ⓒ. Common to chassis.
Set signal generator to 45MC with .001MFD capacitor in series with high side. A signal of less than 600 microvolts from generator should produce one volt on VTVM.

OVERALL SENSITIVITY MEASUREMENT

Remove short from pin 9 of V2. Connect FM signal generator across antenna with a 120Ω in each lead. Set tuner to channel 12 and signal generator for 207MC at 30% modulation. Remove short point Ⓑ and chassis. Rotate contrast control fully clockwise and fine tuning control for maximum output.
Connect the high side of oscilloscope to pin 1 (cathode) of picture tube. Low side to chassis. A signal of less than 25 microvolts should give peak to peak reading of 18 volts AC at oscilloscope.
The scope may be calibrated by connecting the vertical deflection plates to a 6.3 volt filament supply. This amplitude on scope will be approximately equal to a peak to peak of 18 volts AC for sensitivity measurements.

UHF TUNER WTT-37 ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion of the receiver should not be required in the field.

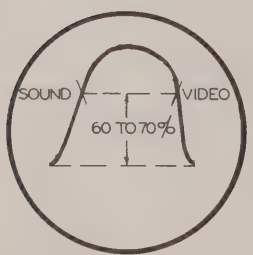


FIG. 7

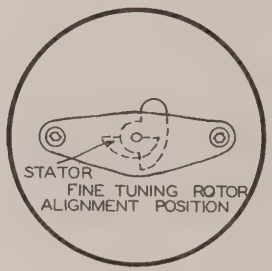


FIG. 8

FIG. 9

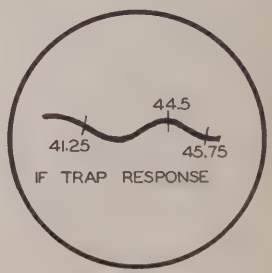
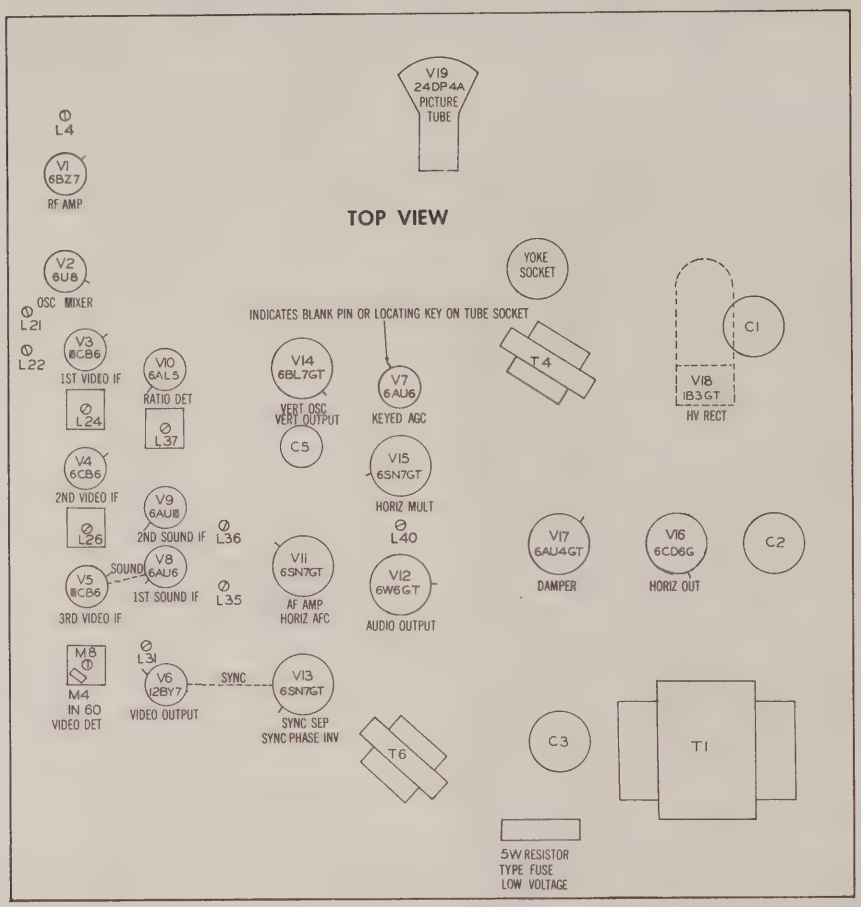


FIG. 10

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - Selenium Rectifiers (M1 & M2) Fuse M3

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V12
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V6, V7, V19
Has pic, no sound - V8, V9, V10, V11, V12
Overloaded picture - V7

SYNC FAILURE
No vert. sync - V13, V14
No horiz. sync - V11, V13, V15
No vert. or horiz. sync - V13

SWEEP FAILURE
No raster, has sound - V15, V16, V17, V18, V19
No vertical deflection - V14
Poor vert. linearity or foldover - V14
Poor horiz. linearity or foldover - V15, V16, V17
Narrow picture - V15, V16, V17, V18, M1, M2
Vert. off freq. - V13, V14
Horiz. off freq. - V11, V13, V15

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BZ7	INF	600KΩ	0Ω	0Ω	.1Ω	†3.7KΩ	INF	INF	0Ω
V 2	6U8	■2KΩ	900KΩ	■330KΩ	.1Ω	0Ω	■15KΩ	0Ω	0Ω	15KΩ
V 3	6CB6	250KΩ	47Ω	0Ω	.1Ω	†3KΩ	†3KΩ	0Ω		
V 4	6CB6	250KΩ	47Ω	.1Ω	0Ω	†3KΩ	†3KΩ	0Ω		
V 5	6CB6	3Ω	120Ω	.1Ω	0Ω	■1KΩ	■1KΩ	0Ω		
V 6	12BY7	50Ω	4.7KΩ	50Ω	0Ω	0Ω	.1Ω	■5KΩ	■500Ω	50Ω
V 7	6AU6	■35KΩ	■0Ω	0Ω	.1Ω	220KΩ	†50Ω	■0Ω		
V 8	6AU6	2.2Ω	0Ω	0Ω	.1Ω	■10KΩ	■10KΩ	150Ω		
V 9	6AU6	♦15KΩ	50KΩ	0Ω	.1Ω	†2.2KΩ	†2.2KΩ	♦150Ω		
V 10	6AL5	INF	INF	0Ω	.1Ω	15KΩ	0Ω	0Ω		
V 11	6SN7GT	300KΩ	22KΩ	100KΩ	300KΩ	†33KΩ	1.5KΩ	.1Ω	.4Ω	
V 12	6W6GT	TP	0Ω	†255Ω	†50Ω	60KΩ	TP	.1Ω	50KΩ	
V 13	6SN7GT	1.8Meg	■1.2Meg	50Ω	22KΩ	■9.5KΩ	2.2KΩ	.1Ω	0Ω	
V 14	6BL7GT	▲2.2Meg	▲1KΩ	9KΩ	500KΩ	▲2.2Meg	45Ω	.1Ω	0Ω	
V 15	6SN7GT	4.9Meg	†10KΩ	1KΩ	150KΩ	†70KΩ	1KΩ	.1Ω	0Ω	
V 16	6CD6G	TP	.1Ω	0Ω	TP	550KΩ	TP	0Ω	■700Ω	Top Cap ▲20Ω
V 17	6AU4GT	NC	TP	350KΩ	NC	†50Ω	TP	.1Ω	0Ω	
V 18	1B3GT		PINS	1 - 8	HAVE	INFINITE	RESISTANCE			Top Cap ▲175Ω
V 19	24DP4A	.1Ω	■1.6Meg	Pin 6 .1Ω	Pin 10 ▲20Ω	Pin 11 ■100KΩ	Pin 12 0Ω			

♦ MEASURED FROM PIN 2 OF V9.
† MEASURED FROM OUTPUT OF M1.
■ MEASURED FROM 145V LINE.
▲ MEASURED FROM PIN 3 OF V17.
TP - TIE POINT
NC - NO CONNECTION

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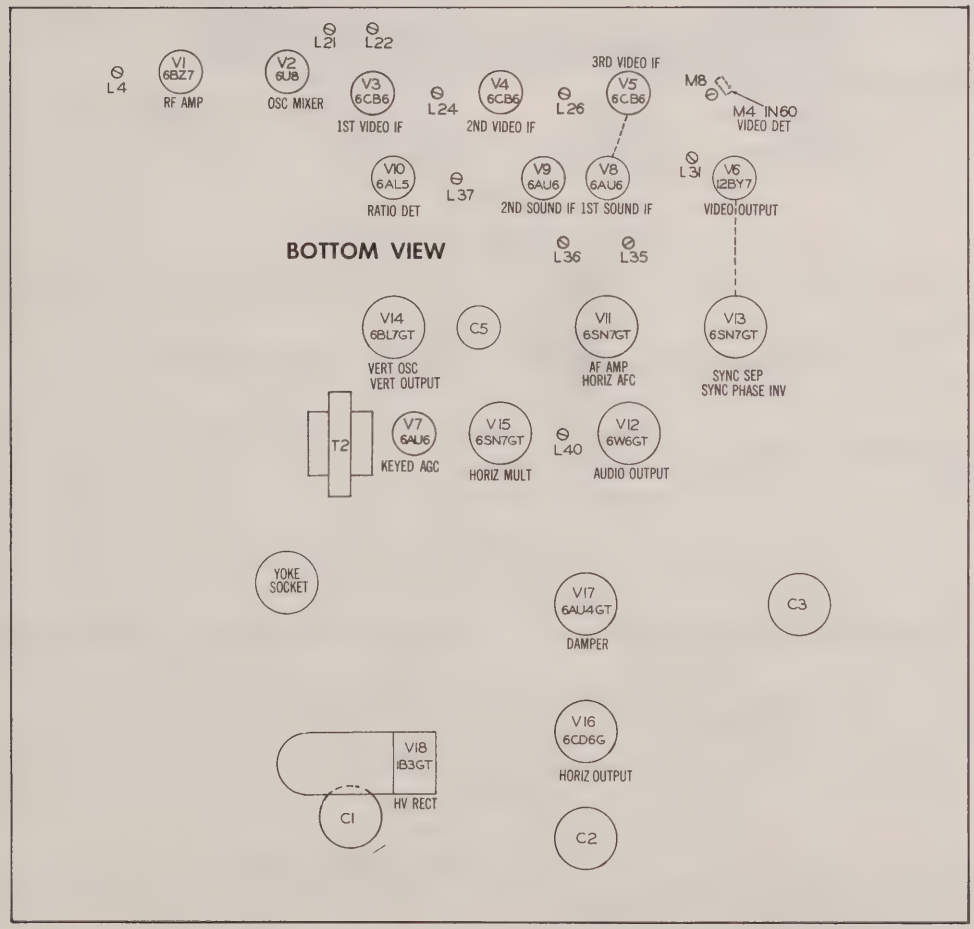


TUBE PLACEMENT CHART

SET 278 FOLDER 7

MOTOROLA MODELS 21C3, B, 21K21, B, 21K22, 21K23, B, 21K24, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K21, B, Y21K22, Y21K23, B, Y21K24, Y21T19, B, Y24K4, B, Y24K5, B (Ch. T5-528, Y, T5-603, Y)

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V16 and V17. Check M1 and M2. Check horizontal size adjustment. Check T3, T5A, C96, C94, R96, R98 and other associated components.

DRIVE LINES

Check by substitution V12, V16 and V17. Check C96, R96, R90, T3 and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V16 and V17. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V15, V16 and V17. Check C90 for open. Check L38, C92, R88, R4 and other associated components.

XMAS TREE EFFECT

Check by substitution V15, V16 and V17. Check T3 and T5 for internal arcing. Check C86, C85, C92, C93, R92, R93, R96 and other associated components.

VERTICAL

LOSS OF SWEEP

Substitute V14. Check waveform W9.

If Satisfactory	If Unsatisfactory
Check T4, T5B, R7, R74, R75 and other associated components.	Check T2, C79, C4, R8 and other associated components.

INSUFFICIENT SWEEP

Substitute V14. Check vertical size and vertical linearity controls for proper operations. Check R8 and other associated components.

COMPRESSED AT BOTTOM

Substitute V14. Check T2, C79, C4, R8 and other associated components.

COMPRESSED AT TOP

Substitute V14. Check C2C, R7, R74, R75 and other associated components.

FOLDS

Substitute V14. Check R8, R77, C4, C80, C81 and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Substitute V13. Check C72, C74, C75, R65, R66, R69, R70 and other associated components.

LOSS OF VERTICAL SYNC - HORIZONTAL SYNC SATISFACTORY

Substitute V14. Check C76, C79, T2 and R5. Check vertical integrator network.

LOSS OF HORIZONTAL SYNC - VERTICAL SYNC SATISFACTORY

Check by substitution V11 and V15. Check C83, C84, C89, C92, L38, R82, R86 and other associated components.

HORIZONTAL BENDING

Check by substitution V13, V11 and V15. Check horizontal AFC network.

VIDEO

LOSS OF VIDEO

Substitute V6. Check C48, C5A, C50, R36, R37, R38, L34, L33 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A12. Check video IF alignment.

POOR CONTRAST

Substitute V6. Check contrast control. Check L30, L29, C50, R41 and other associated components.

NEGATIVE PICTURE

Substitute V6. Check picture tube. Check video crystal detector. Check C50, R41, R38 and other associated components.

SMEAR

Substitute V6. Check L29, L28, L30, L32, L33, L34, C50 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V1, V3, V4, V5 and V6 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V8, V9, V10, V11 and V12. Check stages V11 and V12 using audio signal generator . Apply audio signal across R2B.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF stages for component failure or change of value.	Check C65, C70, C71, C5C, R60, R59, T6, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A11 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or No Sound".

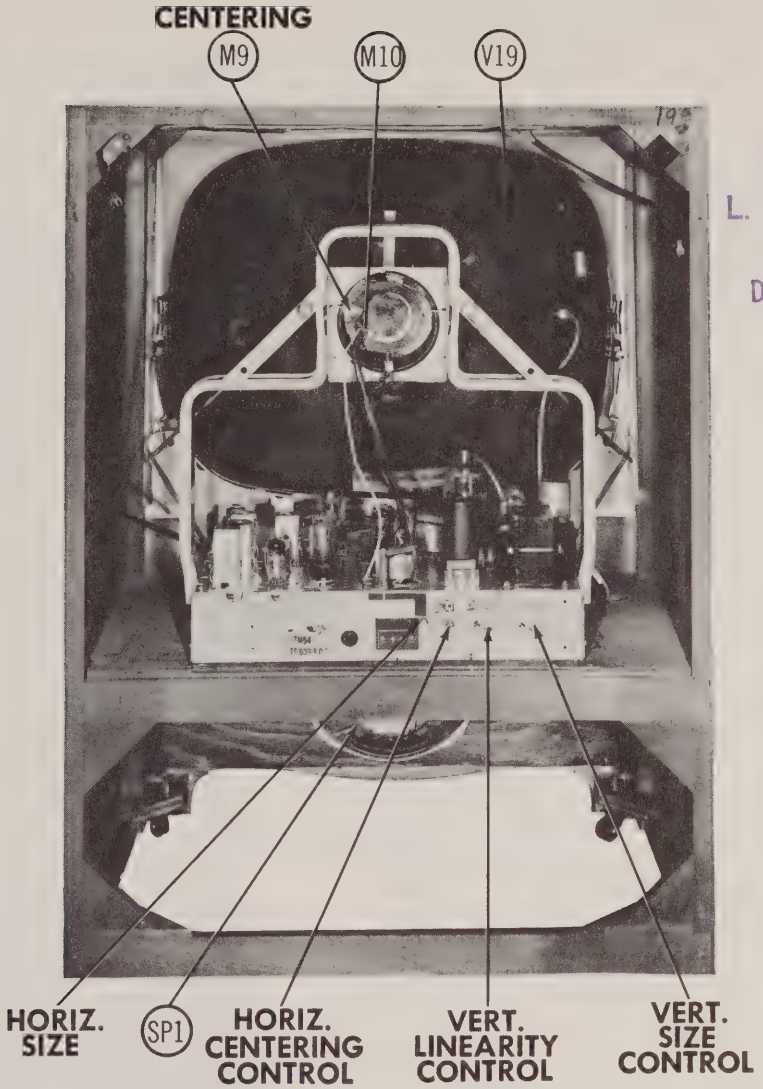
POWER

DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, substitute V12. Check M1, M2 and R98. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Check M1, M2 and R98. Check B+ filter and decoupling network.



CABINET—REAR VIEW

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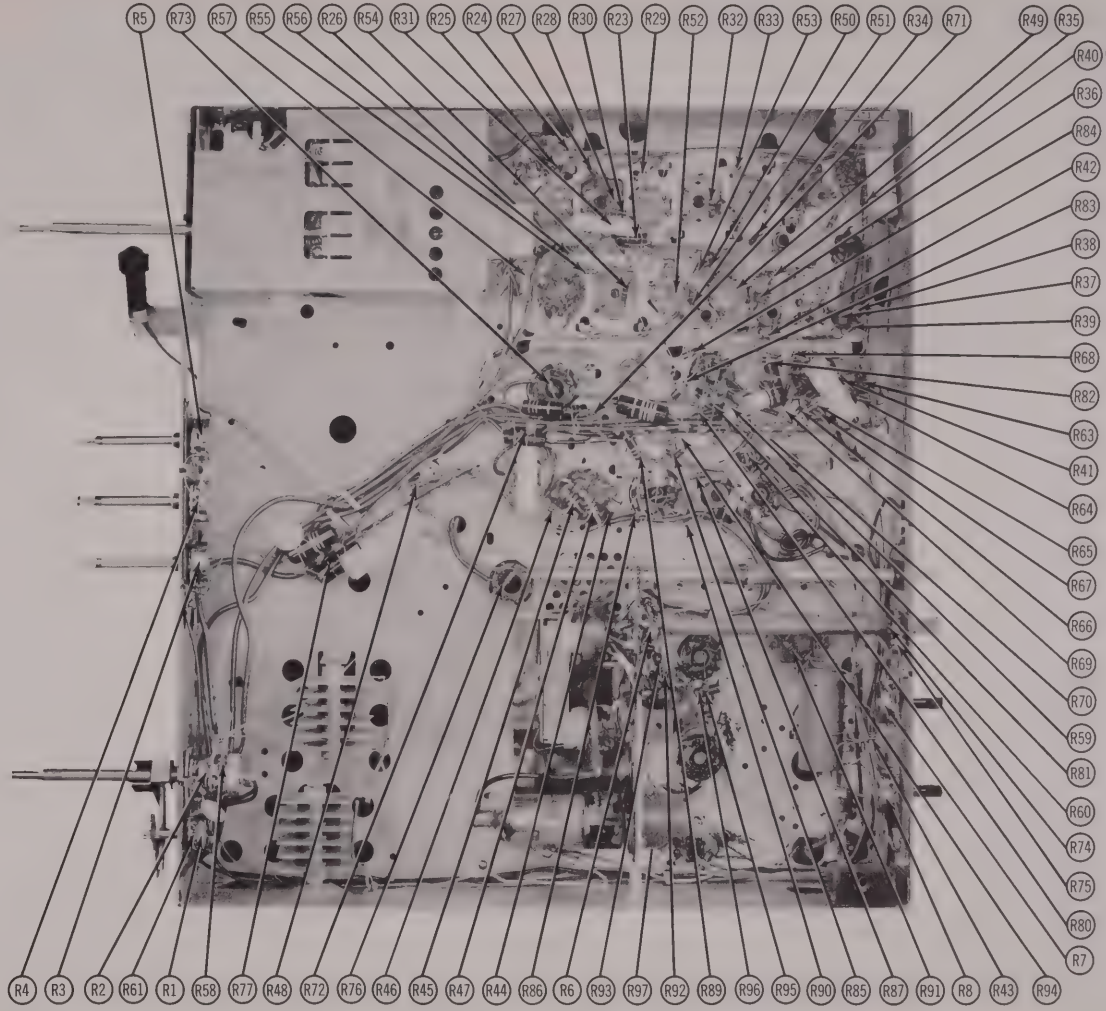
HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern. Normally the horizontal hold control will have a sync range of approximately 20 degrees. If the control is too critical, adjust as follows.

1. Shut the horizontal oscillator coil (L38) to ground with a .25MFD 400 volt capacitor. This may be done with the chassis in the cabinet by placing the capacitor across the 2 pin receptacle on rear of chassis.
2. With the horizontal centering lever, move the picture to the right so the left edge of the raster can be seen. Adjust the horizontal hold control (R4) until no blanking pulse appears and the picture just starts to fold on the left. (The blanking pulse is the gray bar just to the left edge of the raster.) It may be necessary to adjust the contrast and brightness controls to make the pulse visible.
3. Remove the .25MFD capacitor from across L38.
4. Adjust the horizontal oscillator coil slug (B1) until no sync pulse can be seen as in step 2. Recenter picture.

Adjust the horizontal size adjustment for a picture slightly wider than necessary to fill the mask horizontally.



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DENVER, COLORADO

CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

MOTOROLA MODELS 21C3, B, 21K21, B, 21K22, 21K23, B, 21K24, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K21, B, Y21K22, Y21K23, B, Y21K24, Y21T19, B, Y24K4, B, Y24K5, B (Ch. T5-928, Y, T5-603, Y)

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		MOTOROLA PART No.	STANDARD REPLACEMENT		
V1	RF Amp.	6BZ7	6BZ7	9AJ	
V2	Mixer-Osc.	6U8	6U8	9AE	
V3	1st Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd Video IF Amp.	6CB6	6CB6	7CM	
V6	Video Output	12BY7	12BY7	9BF	
V7	AGC Keying	6AU6	6AU6	7BK	
V8	1st Sound IF Amp.	6AU6	6AU6	7BK	
V9	2nd Sound IF Amp.	6AU6	6AU6	7BK	
V10	Ratio Det.	6AL5	6AL5	6BT	
V11	AF Amp-Horiz. AFC	6SN7GT	6SN7GT	8BD	
V12	Audio Output	6W6GT	6W6GT	7S	
V13	Sync Sep-Sync Phase Inv.	6SN7GT	6SN7GT	8BD	
V14	Vert. Osc. - Vert. Output	6BL7GT	6BL7GT	8BD	
V15	Horiz. Mult.	6SN7GT	6SN7GT	8BD	
V16	Horiz. Output	6CD6G	6CD6G	5BT	
V17	Damper	6AU4GT	6AU4GT	4CG	
V18	HV Rectifier	1B3GT	1B3GT	3C	

PROPERTY OF
L. F. BLANKENSHIP
3324 MEADE ST.
DENVER, COLORADO

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA					RETMA BASE TYPE	NOTES
	MOTOROLA PART No.	CBS-HYTRON PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.		
V19	24DP4A ①	24DP4A ①	24DP4A ①		24DP4A ①	12L	① Aluminized
	21ALP4A ①	21ALP4A ①	21ALP4A ①		21ALP4A ①	12L	
		21ALP4			21ALP4	12L	
	21YP4A ①	21YP4A ①	21YP4A ①	21YP4A ①	21YP4A ①	12L	
		21YP4	21YP4	21YP4	21YP4	12L	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	MOTOROLA PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1	140	150	23B484097			FP117	TM-140-150	D-086	
C2A	▲140	150	23B731523			FP312.5	TM-3125	D-090	
B	■200	150				TC68		FM-25100	
C	▲60	200							
C3A	▲200	150	23B710941			FP216.1	TD-200-150	D088	
B	▲5	150					TD-8-150		
C4	10	500	23B731537			TC82	TD-10-500	S-310	
C5A	■30	150	23B733494			FP333.6	TM-30-150	S-070	
B	10	50					TDL-D10-50	FMD-0510	
C	▲10	50							
C6	22		21R120539						
C7	22		21R120539						
C8	1-6		20K731175	829-6					
C9	4		21R115953						
C10	6.8		21R120561						
C11	470		21R115856	D6-470	GP2K-471	UC-5347			
C12	220		21R410115	D6-221		UC-5322			
C13	10000		21R482726	DD-103	811-01	DC-511			
C14	2.2		21R115948	TCZ-2.2	NP0A-2R2				
C15	10		21R121837						
C16	1000		21R115386	DD-102	801-001	DC-521			
C17	470		21R121478	DD-471	831-471	UC-5347			
C18	.5-3		21K710943	829-3	3115-01-0R5	CT565A			
C19	1500		21R120100	DD-152	801-0015	DC-5215			
C20	1500		21R120100	DD-152	801-0015	DC-5215			
C21	22		21R119049	D6-220	GP1K-220	UC-5422			
C22	1		21R114071						
C23	.5-3		21R710943	829-3	3115-01-0R5	CT565A			
C24	12		21R121110						
C25	1500		21R120100	DD-152	801-0015	DC-5215			
C26	10000		21R482726	DD-103	811-01	DC-511			
C27A	800		21R400943	DD2-102	821-001	DCD-521			
B	800								
C28	10000		21R482726	DD-103	811-01	DC-511			
C29	470		21R121478	DD-471	831-471	UC-5347			
C30	1500		21R120100	DD-152	801-0015	DC-5215			
C31	1500		21R120100	DD-152	801-0015	DC-5215			
C32	1500		21R120100	DD-152	801-0015	DC-5215			
C33A	1500		21R121406	DD2-152	812-0015	DCD-5215			
B	1500								
C34	.25	200	8R121575			PT4025	IMP2-P25	3302025	
C35	100		21R410036	TCN-100	N750L-101	NT-531			
C36	470		21R114554	DD-471	831-471	UC-5347			
C37	.25	200	8R121575			PT4025	IMP2-P25	3302025	
C38	560		21R120936	D6-561	811-561	UC-5356			
C39	470		21R114554	DD-471	831-471	UC-5347			
C40	1000		21R115386	DD-102	801-001	DC-521			
C41	560		21R120936	D6-561	811-561	UC-5356			
C42	1000		21R115386	DD-102	801-001	DC-521			
C43	470		21R114554	DD-471	831-471	UC-5347			
C44	1000		21R115386	DD-102	801-001	DC-521			
C45	470		21R114554	DD-471	831-471	UC-5347			
C46	470		21R114554	DD-471	831-471	UC-5347			
C47	470		21R114554	DD-471	831-471	UC-5347			
C48	5000		21R115312	DD-502	811-005	DC-525			
C49	30		21R410048						
C50	.1	200	8K120875	DF-104		PT401	IMP2-P1	330201	
C51	5000		21R115312	DD-502	811-005	DC-525			
C52	1500	2000	21R121863	DD30-152	3KV-152				
C53	2.2		21R115949	TCZ-2.2	NP0A-2R2				
C54	18		21R120578	TCN-18	N750K-180				
C55	10000		21R482726	DD-103	811-01	DC-511			
C56	10000		21R482726	DD-103	811-01	DC-511			

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No	RATING CAP.	RATING VOLT	REPLACEMENT DATA MOTOROLA PART No	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C57	1500		21R126100	DD-152	801-001	DC-5215			
C58	10000		21R483726	DD-103	811-01	DC-511			
C59	10000		21R483726	DD-103	811-01	DC-511			
C60	10000		21R483726	DD-103	811-01	DC-511			
C61	5000		21R115312	DD-502	811-005	DC-525		C-1250	
C62	1500		21R126100	DD-152	801-0015	DC-5215		C-1215	
C63	1000		21A121678	DD-102	801-001	DC-521		K-1210	
C64	1000		21A121678	DD-102	801-001	DC-521		K-1210	
C65	5000		21R115312	DD-502	811-005	DC-525	DM5-D5	C-1250	
C66	5000		21R115312	DD-502	811-005	DC-525	DM5-D5	C-1250	
C67	3300		6R121569	DH-332	811-0033	DC-5333	DM5-D33	C-1233	
C68	.005	1000			1R3EY-472	PT515	CT10-D5		
C69	.02	400	8R121566	DF-303	81T-03	PT412	DM4-S2	330412	
C70	10000		21R483726	DD-103	811-01	DC-511			
C71	10000		21R483726	DD-103	811-01	DC-511			
C72	4700		8K402332	DD-502	811-005	DC-525		C-1247	
C73	47		8R115593	DB-470	831-470	DC-5447		K-1447	
C74	220		21R115905	DB-221	GP3K-221	UC-5323		K-1323	
C75	.05	400	8R121567	DF-503		PT415	DM4-S5	330415	
C76	.0047	400	8K490332	DS-472	GP2-333-472	PT2347	DM2E-D47	3306347	
C77	.0047	400	8K490332	DS-472	GP2-333-472	PT2347	DM2B-D47	3306347	
C78	.01	400	8K490336	DS-103	GP2-333-103	PT311	DM2-S1	330311	
C79	4700		8R121569	DD-502	811-005	DC-525		C-1247	
C80	.047	400	8R121567	DF-503		PT347	DM4-S47	330447	
C81	.047	400	8R121567	DF-503		PT347	DM4-S47	330447	
C82	5000	2000	21R120093						
C83	470		21R115856	DS-471	GP3K-471	UC-5346		K-1347	
C84	470		21R115856	DS-471	GP3K-471	UC-5346		K-1347	
C85	1000		21R114749	DS-102	GP3L-102	UC-531		K-1310	
C86	470		21R115856	DS-471	GP3K-471	UC-5347		K-1347	
C87	.001	1000	8K490388	DD5-102	1R5KV-102	PT531	CT10-D1	3U5-001	
C88	.003	800	8R121569	DS-302	GP2-333-302	PT323	DM2E-D3	330623	
C89	.003	800	8R121569	DS-302	GP2-333-303	PT323	DM2E-D3	330623	
C90	.01	400	8R121003	DS-103	GP2-333-103	PT411	DM4-S1	330411	
C91	100		21R115906	DA-101	GP3K-101	UC-531		K-1310	
C92	.0047	400	8K490332	DS-472	GP2-333-473	PT2347	DM2E-D47	3306347	
C93	390	500	21KU14740			MC3E43		KR-1339	
C94	390	500	21KU14740			MC3E43		KR-1339	
C95	.039	400	8K490321					3306139	
C96	5000		21R115313	DD-502	811-005	DC-525		C-1250	
C97	100	3000	21R121624	DD30-101	3KV-101				
C98	72	1000	21R121936						

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA MOTOROLA PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	18A723887	Qil-137	A47-1Meg-S	AB-89	U-54	Accoustator
B	Shaft		Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R1A
R2A	250Ω	½	18B733384		RTV-498		UK-38	Contrast - Panel
B	1Meg	½						Volume & Switch tapped at 250KΩ - Rear
R3A	5Meg	½	18B734142	Qil-141	A47-5Meg-S	AB-97	U-67	Brightness
B	Shaft		Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R3A
R4A	250KΩ with 50KΩ stop	½	18K734646	Qil-139	A47-250K-S	AB-48	U-48	Horiz. Hold - Note 1
B	Shaft		Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R4A
R5A	450KΩ with 400KΩ stop	½	18B734143	Qil-143	A47-500K-S	AB-59	U-50	Vert. Hold - Notes 2 & 3
B	Shaft		Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R5A
R6	75Ω	1	18K731285		30-75			Horiz. Centering - (Wire Wound) - Note 4
R7A	750Ω	½	18K733414	Qil-105	A47-750-S	AB-415	U-4	Vert. Linearity - Note 5
B	Shaft		Not Req.	TQ	FKS-1/4	AK-4	Not Req.	Attach to R7A
R8A	7Meg with 2Meg stop	½	18B733413	Qil-141	A47-7Meg-S	AB-96	U-65	Vert. Size - Notes 6 & 7
B	Shaft		Not Req.	TQ	FKS-1/4	AK-4	Not Req.	Attach to R8A

Note 1: Connect a 47KΩ resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control. (Control viewed from shaft end, terminals down.)
Note 2: Connect a 330KΩ resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control. (Control viewed from shaft end, terminals down.)
Note 3: Some versions may use an alternate control part no. 18K734143.
Note 4: Part of Horiz. Output Transformer (T3) used in chassis TS-528 and TS-503 series only.
Note 5: Some versions may use an alternate control part no. 18A702475.
Note 6: Some versions may use an alternate control part no. 18A702443.
Note 7: Connect a 2Meg resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control. (Control viewed from shaft end, terminals down.)

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA MOTOROLA PART No.	IRC PART No.	NOTES
R9	1Meg	½	6R6004	BTS-1Meg	
R10	47KΩ	½	6R6056	BTS-47K	
R11	22KΩ	½	6R6039	BTS-22K	
R12	10KΩ	½	6R6054	BTS-10K	
R13	470Ω	½	6R6090	BTS-470	
R14	1000Ω	½	6R6031	BTS-1000	
R15	15KΩ	½	6R2119	BTS-15K	
R16	1000Ω	½	6R6031	BTS-1000	
R17	330KΩ	½	6R6014	BTS-330K	
R18	4700Ω	½	6R6039	BTS-4700	
R19	330KΩ	½	6R6014	BTS-330K	
R20	4700Ω	½	6R6039	BTS-4700	
R21	10KΩ	½	6R6054	BTS-10K	
R22	1000Ω	½	6R6301	BTS-1000	
R23	27000Ω	1	6R6490	BTA-2700	
R24	1000Ω	1	6R6301	BTS-1000	
R25	18KΩ	1	6R6591	BTS-18K	
R26	47Ω	1	6R6550	BTS-47	
R27	1000Ω	1	6R6301	BTS-1000	
R28	33KΩ	1	6R6410	BTS-33K	
R29	47Ω	1	6R6550	BTS-47	
R30	220Ω	3	6R3933	BTS-220	
R31	3000Ω	5	17K733878	PWT-3000	
R32	33KΩ	1	6R6410	BTS-33K	
R33	120Ω	1	6R555i	BTS-120	
R34	1000Ω	1	6R6301	BTS-1000	
R35	4700Ω	3	6R6080	BTS-4700	
R36	470Ω	2			
R37	5000Ω	5	17R12123	1 3/4A-5000	

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA MOTOROLA PART No.	IRC PART No.	NOTES
R38	22KΩ	½	6R3098	BTS-22K	
R39	10KΩ	½	6R6539	BTS-10K	
R40	33KΩ	½	6R6410	BTS-33K	
R41	100KΩ	½	6R6031	BTS-100K	
R42	1Meg	½	6R6046	BTS-1Meg	
R43	470KΩ	½	6R6577	BTS-470K	
R44	330KΩ	1	6R5711	BTA-330K	
R45	820KΩ	1	6R2033	BTA-820K	
R46	330KΩ	1	6R3096	BTS-330K	
R47	470KΩ 5%	1	6R46025	BTA-470K 5%	
R48	2.7Meg 5%	½	6R48B86	BTS-2.7Meg 5%	
R49	150Ω	½	6R3992	BTS-150	
R50	10KΩ	1	6R6430	BTA-10K	
R51	15KΩ	1	6R6477	BTA-15K	
R52	150Ω	1	6R3992	BTA-150	
R53	2200Ω	1	6R6290	BTS-2200	
R54	2200Ω	1	6R6290	BTS-2200	
R55	120Ω	1	6R555i	BTS-120	
R56	33KΩ	½	6R6013	BTS-33K	
R57	15KΩ	1		BTA-15K	
R58	68KΩ	½	6R6061	BTS-68K	
R59	15000Ω 5%	1	6R4004B9	BTS-1500 5%	
R60	33KΩ 5%	½	6R5756	BTA-33K 5%	
R61	47KΩ	½	6R6048	BTS-47K	
R62	470KΩ	½	6R6577	BTS-470K	Note 1
R63	270KΩ	½	6R6414	BTS-270K	
R64	1.5Meg	½	6R6460	BTS-1.5Meg	
R65	1.2Meg	½	6R5663	BTS-1.2Meg	
R66	560KΩ	½	6R5697	BTS-560K	
R67	22KΩ	½	6R6597	BTS-22K	
R68	2200Ω	½	6R6059	BTS-2200	
R69	6800Ω	1	6R6438	BTS-6800	
R70	2700Ω	1	6R5577	BTS-2700	
R71	22KΩ	1	6R5028	BTS-22K	
R72	10KΩ	1	6R5048	BTS-10K	
R73	100Ω	1	6R6018	BTS-100	
R74	4700Ω	2	6R5671	BTS-4700	
R75	3900Ω	2	6R47012	BTS-3900	
R76	120Ω	1	6R5551	BTS-120	
R77	5600Ω	1	6R617	BTS-5600	
R78	470Ω	1	6R6090	BTS-470	
R79	470Ω	1	6R6090	BTS-470	
R80	100KΩ	1	6R6031	BTS-100K	
R81	100KΩ	1	6R6031	BTS-100K	
R82	100KΩ	1	6R6031	BTS-100K	
R83	47Ω	1	17K488266		
R84	22KΩ	1	6R6397	BTS-22K	
R85	4.7Meg	1	6R5212	BTS-4.7Meg	
R86	1000Ω	1	6R6229	BTS-1000	
R87	5600Ω	1	6R617	BTS-5600	
R88	47KΩ	1	6R6048	BTS-47K	Note 1
R89	6.8Ω	1	6K120580		
R90	68KΩ	1	6R6074	BTS-68K	
R91	4700Ω	2	6R6080	BTS-4700	
R92	150KΩ	1	6R40053	BTA-150K	
R93	150KΩ	1	6R40053	BTA-150K	
R94	4700Ω	2	6R6080	BTS-4700	
R95	680KΩ	2		BTS-680K	
R96	680Ω	1	6R18231	BTA-680	
R97	3.3Ω	1	17K485413		
R98	7.5Ω	5	17A715500		

Note 1: Not used in some versions.

TRANSFORMER (FILAMENT)

ITEM No.	RATING PRI	RATING SEC 1	RATING SEC 2	REPLACEMENT DATA MOTOROLA PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	RCA TYPE No.	Halldorson PART No.	Thordarson PART No.	NOTES
T1	117VAC	5.3VAC @ .85A	6.3VAC @ 13A	25K734638-B 25B733199 ①							

① Alternate filament transformer.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Rem PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Vert. Osc. Trans.	25K731565	S6702	A-3003		V40S	A-8S25	24A67 ① FLY-74*	A-97X
T3	Horiz. Output Trans.	24C731610 ③				X118*			
T4	Vert. Output Trans.	25B731015	21S05 ④	A-30S ①⑤		V30S ① ⑤	A-S40 ① ④	24S67 ① ④	A-S0X ①
T5A	Yoke (90°) Horiz (25MH)	25K731567 ② 24D733239 ⑤							
B	Vert (2.4MH)								

① Drill new mounting hole(s).
② Includes V18, HV Rectifier, R6, Horiz. centering control. Motorola part no. 18K721285.
③ Alternate vert. output trans.
④ Connect as auto trans.
⑤ Use 50 to 1 buffer ratio.
⑥ Includes actual plug, Motorola part no. 38A732677. Does not includes rear cover and centering device, Motorola part no. 46A721145.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Rem Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
8				8		6	
5				5		5	
4				4		4	
3				3		3	
				2 or 1		1	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI	IMPEDANCE SEC	REPLACEMENT DATA MOTOROLA PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	NOTES
T6	3.17KΩ	3.8Ω	35B733442	A-3649	A-2902	S-1X ①	21006	22S67	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS SIZE	FIELD	V C IMP	REPLACEMENT DATA MOTOROLA PART No	JENSEN PART No	QUAM PART No	NOTES
SP1	10"	5Ω	3.5Ω	50K734373 ① 50K734416 ②			10E506 ① Used in Models 24K4, 24K4B, Y24K4, Y24K4B, 21K31, 21K31B, Y21K21 and Y21K21B
	8"	5Ω	3.0Ω	50K734314 ② 50K734315 ③			8E506 ② Used in models Y24K0 and Y25K58
	8"	5Ω	3.5Ω	50K700950 ③ 50C703331 ④ 50C703098 ⑤ 50C720156 ⑥ 50C721264 ⑦			8E658 ③ Used in Models 21K20, 21K20B, Y21K20 and Y21K20B ④ Used in Models 21K23, 21K23B, Y21K23 and Y21K23B ⑤ Used in Models 21K24 and Y21K24 ⑥ Used in Models 21C3, 21C3B, Y21C3 and Y21C3B
	8"	50Ω	6.4Ω	50C734588 ④			8E506Z8 ⑦ Used in Models 24K3 and Y24K3B
	8"	PM	5.4Ω	80C734587 ⑤	ST-184 Mod. P8-8	8A8	
	6 x 9"	5Ω	3.5Ω	50K734312 ⑥ 50K734313 ⑦			6E506 ⑧ Used in Models 21T18, 21T18B, Y21T18 and Y21T18B
	6"	5Ω	3.5Ω	50K734319 ⑧ 50K734206 ⑨			6E506 ⑨ Used in Models 21T15, 21T15B, Y21T15 and Y21T15B
	6"	50Ω	3.5Ω	50K734316 ⑨ 50K734317 ⑩			6E506 ⑩ Used in Models Y24K5 and Y24K5B
				50K734318 ⑪ 50K734320 ⑫			
	5 1/4"	50Ω	3.5Ω	50C733905 ⑩ 50K734381 ⑪			52E506
	5 1/4"	85Ω	3.5Ω	50C732758 ⑪ 50C732997 ⑫			52E856
				50C732998 ⑬ 50C733259 ⑭			
				50D733908 ⑫ 50D734220 ⑬ 50D734378 ⑭	8T-113 Mod. P4-X	4A1	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA MOTOROLA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	VHF Ant. Matching Trans.	.7Ω	0Ω	24K730677				
L2	VHF Ant. Matching Trans.	.7Ω	0Ω	24K730677				
L3	IF Trans.	0Ω		24A734306				
L4	FM Trap	0Ω		24A734307				
L5	UHF IF Input Coil	0Ω		24A731026				
L6	RF Choke	0Ω		24A732652				
L7	VHF Ant. Coils	0Ω		24K734309				
L8	VHF Ant. Shunt Coil	0Ω		24K734304				High Bands
L9	VHF IF Trap	0Ω		24K734306				Low Channel
L10	VHF Ant. Shunt Coils	0Ω		24C734308				Low Band
L11	VHF Ant. Coil	0Ω						Channel 13
L12	FIL. Choke	0Ω		24K730191				
L13	Next. Coil	0Ω		24S731256				
L14	VHF RF Coil	0Ω		24A734305				Channel 13
L15	VHF RF Coils	0Ω		24S734379				
L16	VHF RF Coil	0Ω		24A734390				
L17	RF Choke	0Ω		24A732652				
L18	RF Choke	0Ω		24A732652				
L19	VHF Osc. Coil	0Ω		24A730736				Channel 13
L20	VHF Osc. Coils	0Ω		24K730639				
L21	Conv. Plate	.1Ω		24S734308				
L22	1st. Video IF	.1Ω		24K733975	17-4523 *	TV-121	6238 ø	
L23	FIL. Choke	0Ω		24K730191	19-1001	TV-189	4604	
L24	2nd. Video IF	.1Ω	.1Ω	24B733484	17-4503 ø	TV-127 ø	6237 ø	Includes 41.25MC trap
L25	FIL. Choke	0Ω		24K730191	19-1001	TV-189	4604	
L26	3rd. Video IF	.1Ω	.1Ω	24B733485	17-4504 ø	TV-128 ø	6238 ø	Includes 47.25MC trap
L27	RF Choke	3Ω		24K735277	19-1003		4606	3.3 Microhenries DC part #CLA
L28	Series Peaking Coil	7Ω		24R130588	19-4300	TV-134 †	6154 †	330 Microhenries, wound on 10KΩ resistor
L29	Shunt Peaking Coil	8Ω		24R119854	19-3250	TV-136	6181	365 Microhenries
L30	Series Peaking Coil	1.8Ω		24R131738	19-1005		4613 ø	13 Microhenries wound on 8.2KΩ resistor
L31	4.5MC Trap	3.3Ω		1V730808	20-1004	TV-151	1689	
L32	Series Peaking Coil	7.5Ω		24R120948	19-3250 †	TV-135 †	6181 †	340 Microhenries, wound on 10KΩ resistor
L33	Shunt Peaking Coil	6.5Ω		24R119850	19-3180 ø	TV-134 ø	6180 ø	190 Microhenries, wound on 10meg resistor
L34	Shunt Peaking Coil	18Ω		24K734187	19-5100 †		4653 †	1 Microhenry, wound on 4.7KΩ resistor
L35	1st. Sound IF	2.5Ω		24K703312	20-1004	TV-151	1689	
L36	2nd. Sound IF	2.8Ω		24B733873	20-1005 ††	TV-151 ††	1470	
L37	Ratio Det.	2.5Ω	.40CT	24B703543	17-1003 ø†	TV-119 ø†	1468 ø†	Tertiary winding - .2Ω
L38	Horiz. Osc.	37Ω		1V732553	19-1576	TV-163	6210	
L39	RF Choke	1.8Ω		24A733225	19-1005		4613	
L40	Cathode Choke	1.8Ω		24A733225	19-1005		4613	

MOTOROLA MODELS 21C3, B, 21K31, B, 21K22, 21K33, B, 21K34, 21T19, B, 24K4, B, 24K5, B, Y21C3, B, Y21K31, B, Y21K22, Y21K33, B, Y21K34, Y21T19, B, Y24K4, B, Y24K5, B (CH. 15-528, 7, 15-603, 7).

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	MOTOROLA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L41	Linearity Coil	17Ω		24A731609			6304 ♦■	5.6 Microhenries, wound on .068MFD Cap.

* Use one winding only.
■ Detune trap.
♦ Use adaptor plate and drill mounting holes.
† Parallel with 10KΩ resistor.
▲ Parallel with 8.2KΩ resistor.
Parallel with 10Meg resistor.
¶ Parallel with 4.7KΩ resistor.
†† Remove capacitor across coil.
■†Drill mounting holes.
♦■ Parallel with .068MFD Cap.

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	MOTOROLA PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.230A	48B733249 48B731643 ①	1236A	RS300	6S300	6Q4	300	① Alternate selenium rectifiers
M2	.230A	48B733249 48B731643 ①	1236A	RS300	6S300	6Q4	300	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			MOTOROLA PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3	1" piece #26 wire							

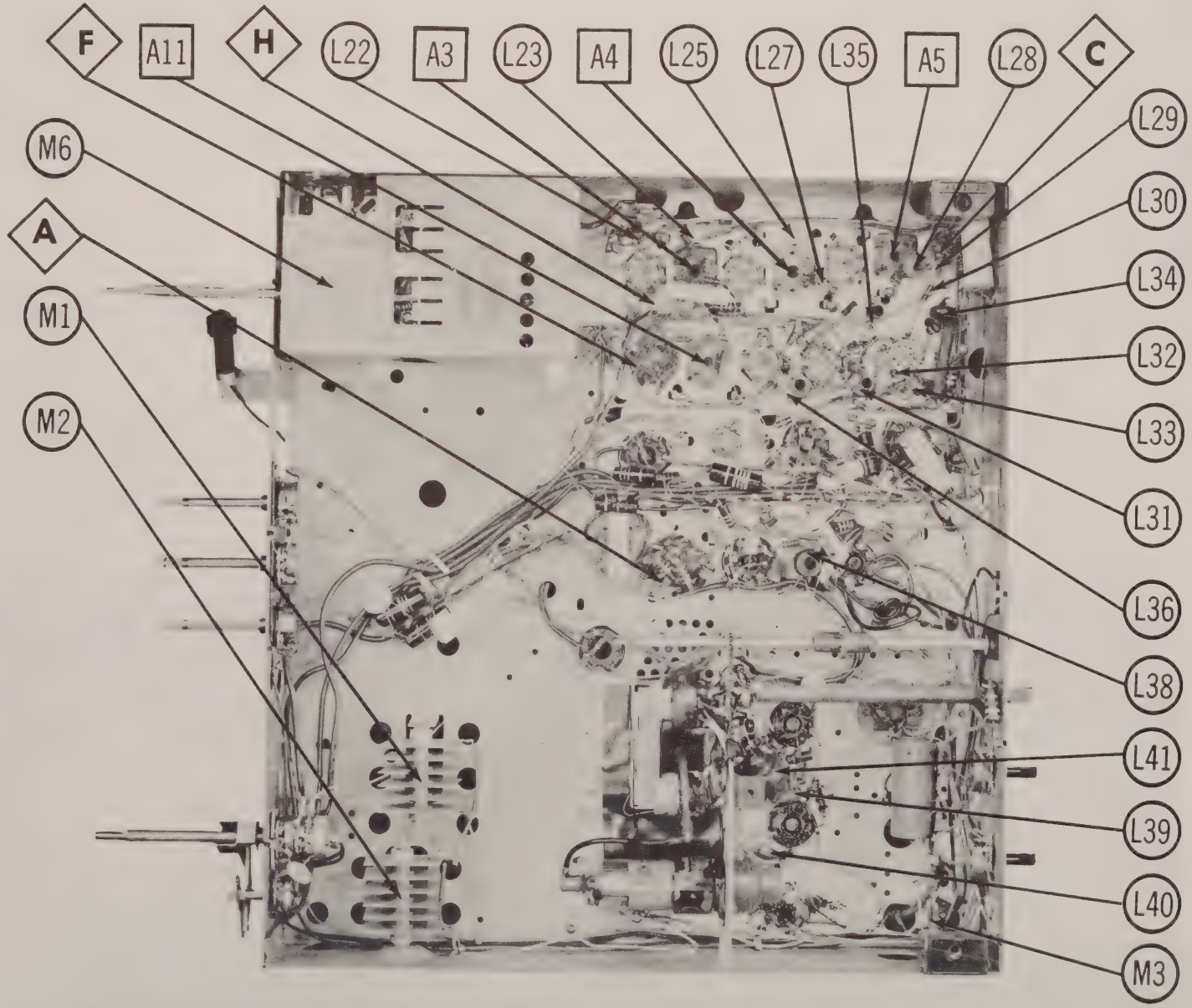
CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		MOTOROLA PART No.	SYLVANIA PART No.		
M4		48K733204*	1N60 or 1N132		Video Det.

* Alternate part no's.
48C711052
48K711077
48K722720
48K733158
48K712199

MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M5	Dial Light		#44, Bayonet
M6	Tuner	1U733422	VHF - Ch. TS-528, TS-603
	Tuner	1U733614	VHF - Ch. TS-528Y, TS-603Y
M7	Tuner	WTT-37	UHF - Ch. TS-528Y, TS-603Y
M8	Video Det. Assy.	24B730616	Includes M4, 4th. Video IF, coils and capacitors
M9	Centering Device	48A721145	Part of yoke cover
M10	Ion Trap	59K734027	Alternate part #59K734028 (For 21" tubes)
	Ion Trap	59A732262	Alternate part #59A731999 (For 24" tubes)
	Cabinet	16F733524	Models 21C3, Y21C3
	Cabinet	16K733525	Models 21C3B, Y21C3B
	Cabinet	16F733325	Models 21K21, Y21K21
	Cabinet	16K733326	Models 21K21B, Y21K21B
	Cabinet	16E733523	Models 21K22, Y21K22
	Cabinet	16K733956	Models 21K23B, Y21K23B
	Cabinet	16E733955	Models 21K23, Y21K23
	Cabinet	16F733597	Models 21K24, Y21K24
	Cabinet	16E733881	Models 21T19, Y21T19
	Cabinet	16K733882	Models 21T19B, Y21T19B
	Cabinet	16E733337	Models 24K4, Y24K4
	Cabinet	16K733338	Models 24K4B, Y24K4B
	Cabinet	16E733828	Models 24K5, Y24K5
	Cabinet	16K733829	Models 24K5B, Y24K5B
	Knob	36K733398	VHF Channel Selector - Models 21C3, 21C3B, 21K21, 21K21B, 21K22, 21K23, 21K23B, 21K24, 21T19, 21T19B, 24K5, 24K5B
	Knob	36K730174	VHF Channel Selector - Models 24K4, 24K4B,
	Knob	36B733397	VHF Channel Selector - Models Y21C3, Y21C3B, Y21K21, Y21K21B, Y21K22, Y21K23, Y21K23B, Y21K24, Y21T19, Y21T19B, Y24K5, Y24K5B
	Knob	36B730171	VHF Channel Selector - Models Y24K4, Y24K4B
	Knob	36C733399	Contrast - All models except 24K4, 24K4B, Y24K4, Y24K4B
	Knob	36C730162	Contrast - Models 24K4, 24K4B, Y24K4, Y24K4B only
	Knob	36C730167	Tone - All models
	Knob	36B733395	Fine tuning and on-off-volume - All models except 24K4, 24K4B, Y24K4, Y24K4B
	Knob	36B733493	Fine tuning and on-off-volume - Models 24K4, 24K4B, Y24K4, Y24K4B
	Scale	34C730165	UHF Channel Indicator - Models Y21C3, Y21C3B, Y21K21, Y21K21B, Y21K22, Y21K23, Y21K23B, Y21K24, Y21T19, Y21T19B, Y24K4, Y24K4B, Y24K5, Y24K5B
	Knob	36B733492	Horiz., Vert. and brightness - Models 21T19, 21T19B, Y21T19, Y21T19B, 24K4, 24K4B, Y24K4, Y24K4B
	Mask	13E734349	Models 21K21, 21K21B, Y21K21, Y21K21B, 21K23, 21K23B, Y21K23, Y21K23B
	Mask	13E734322	Models 21K24, Y21K24
	Mask	13E734209	Models 21T19, 21T19B, Y21T19, Y21T19B
	Mask	13K731714	Models 24K4, 24K4B, Y24K4, Y24K4B, 24K5, 24K5B, Y24K5, Y24K5B
	Safety Glass	61C733473	Models 21C3, 21C3B, Y21C3, Y21C3B, 21K21, 21K21B, Y21K21, Y21K21B, 21K22, Y21K22, 21K23, 21K23B, Y21K23, Y21K23B
	Safety Glass	61K733577	Models 21T19, 21T19B, Y21T19, Y21T19B
	Safety Glass	61K733647	Models 21K4, Y21K24
	Safety Glass	61K733576	Models 24K4, 24K4B, Y24K4, Y24K4B, 24K5, 24K5B, Y24K5, Y24K5B
	Jewel	61B730644	Dial Light



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

PROPERTY OF
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3[illegible] [illegible] ST.
DENVER, COLORADO

TROUBLE SHOOTING AIDS (cont)

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V15, V16, V17, V18 and V12. Check waveform W16.

If Satisfactory	If Unsatisfactory
Check T3, T5A, C97, R96 and other associated components.	Check L38, C89, C91, C92, C96, R90, R91, R87 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V12, V16 and V17. Check M1 and M2. Check R98, R96, C94, C96 and other associated components.

BLOOMING

Check by substitution V16 and V17. Check M1 and M2. Check C96, R96, R98 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or No Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V1, V2, V3, V4, V5, V6 and V12. Check video IF components for failure or change of value.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

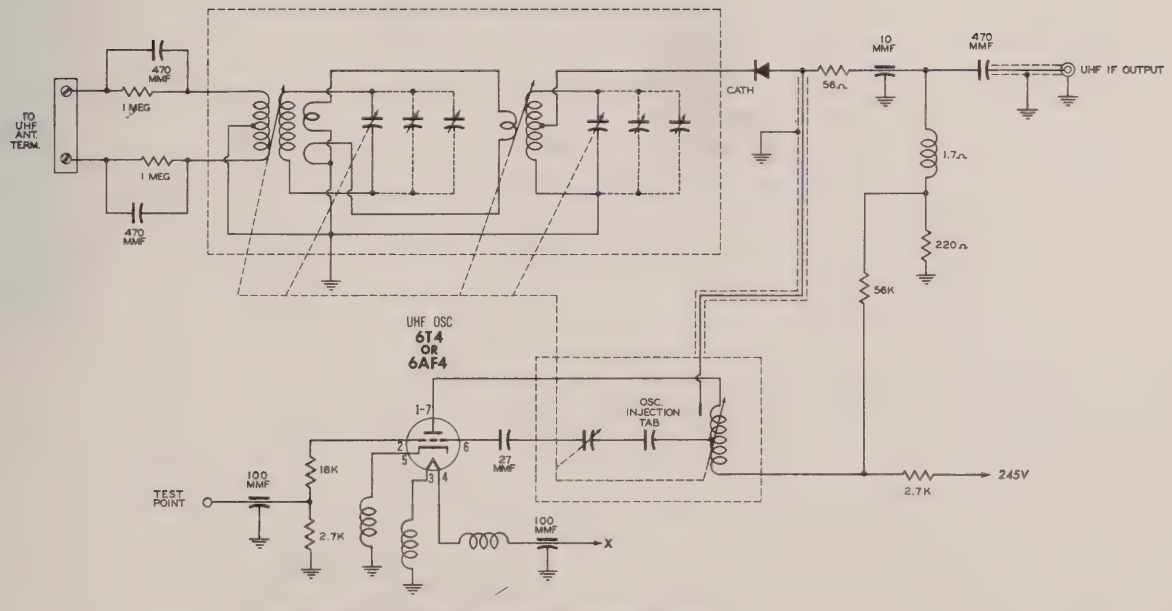
KEYSTONE EFFECT

Check T5 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.



UHF TUNER WTT37 USED ON CHASSIS TS528Y AND TS603Y

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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UHF TUNER SCHEMATIC

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

For touch-up adjustment of VHF tuner oscillator adjustments, it is necessary to remove the chassis from the cabinet. (See alignment instructions.)

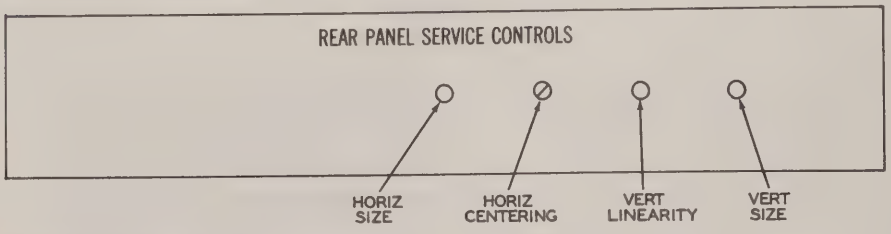
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass, remove 4 metal screws holding metal molding at the top of safety glass. Remove metal molding and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions.)

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator circuit, it is necessary to remove the rear cover and supply power to set. Adjustment is located on top of the chassis. Set the horizontal hold control to the center of its range. Adjust the horizontal oscillator coil slug (L38) until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L37) located on bottom of chassis. Removal of chassis is necessary to adjust. (See tube placement chart.)

FUSES

One 1" piece of #26 wire fuse is used for filament protection. (For location see tube placement chart.)

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

1. Remove 7 push-on type control knobs from front panel of cabinet.
2. Remove 9 wood screws and 1 metal screw. Remove rear cover.
3. Remove 3 wood screws. Remove antenna bracket and lead.
4. Disconnect speaker plug.
5. Remove 4 speaker nuts. Remove speaker.
6. Remove 4 chassis bolts. Remove chassis.

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PHOTOFACT* Folder

*TRADE MARK

RETMA MEMBER

PHILCO MODELS 22C4016, L, 22C4124, L, 22C4126, L, 22C4129, 22C4312, L (Ch. 350)

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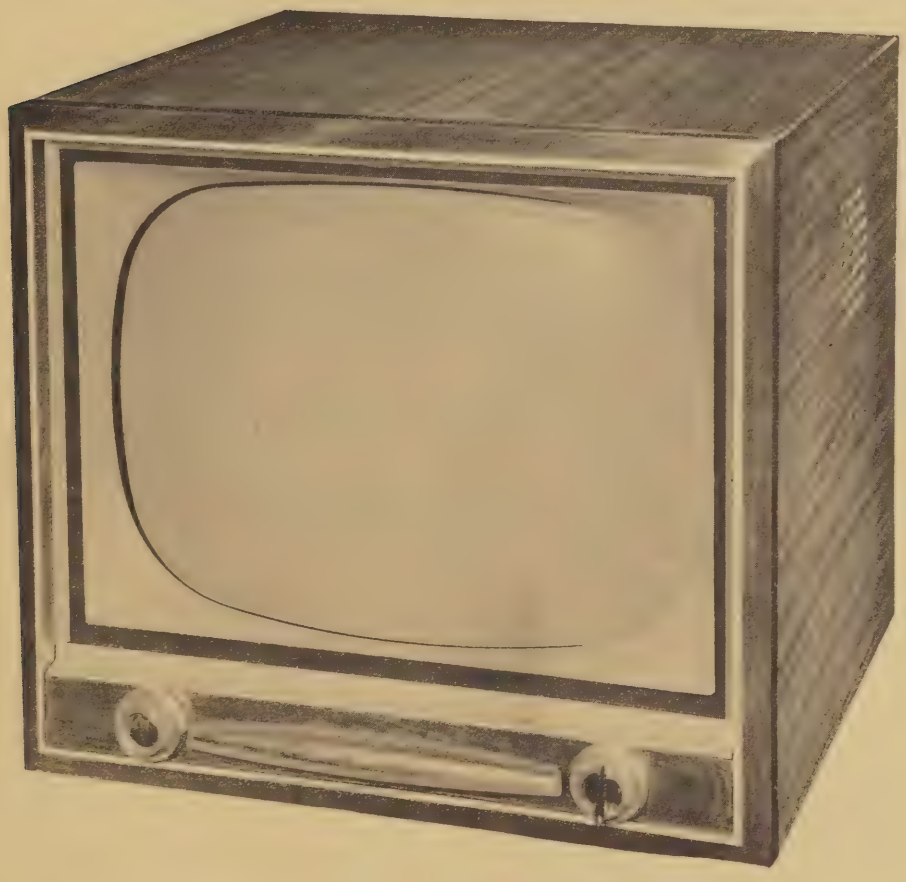
Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.



MODEL 22C4016

PHILCO MODELS 22C4016, L, 22C4124, L, 22C4126, L, 22C4129, 22C4312, L (Ch. 350)

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DATE 5–55 SET 278 FOLDER 8

PHILCO MODELS 22C4016, L, 22C4124, L, 22C4126, L, 22C4129, 22C4312, L (Ch. 350)

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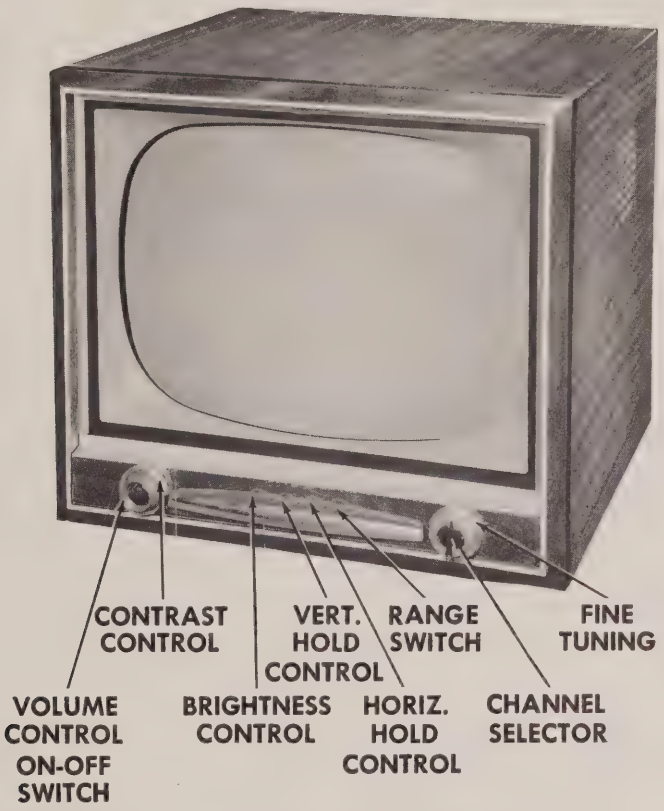

PHILCO MODEL 22C4016

TRADE NAME	Philco	MODELS	CHASSIS
		22C4016, 22C4016L, 22C4124, 22C4124L, 22C4126, 22C4126L, 22C4129, 22C4312, 22C4312L	350
MANUFACTURER	Philco Corp., Tioga & "C" Sts., Philadelphia, Pa.		
TYPE SET	Television Receiver		
TUBES	Twenty		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING 1.5 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

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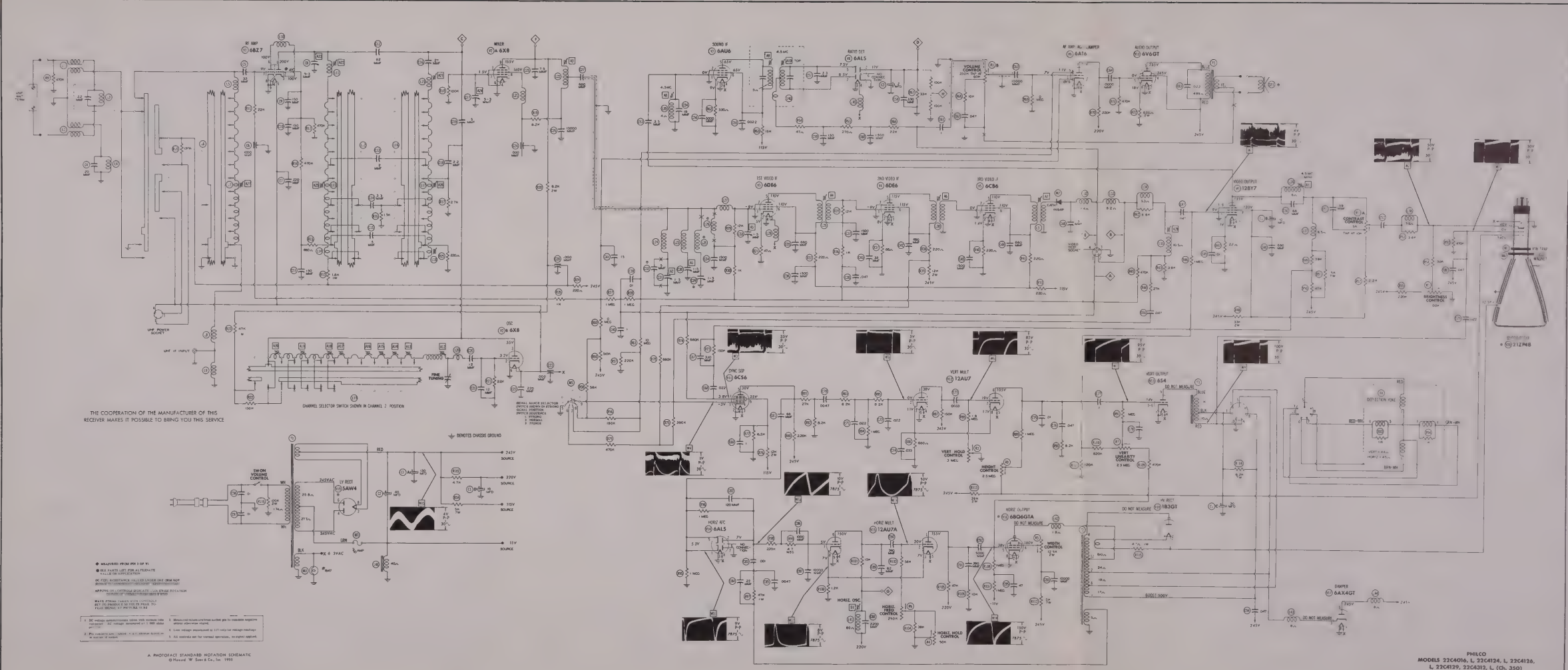
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 7 POSITION
DENOTES CHASSIS GROUND
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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PHILCO
MODELS 22C4016, L, 22C4124, L, 22C4126, L, 22C4129, 22C4312, L (Ch. 350)

PHILCO MODELS 22C4016, L, 22C4124, L, 22C4126, L, 22C4129, 22C4312, L (Ch. 350)

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CHASSIS TOP VIEW

PHILCO MODELS 22C4016, L, 22C4124,
L, 22C4126, L, 22C4129, 22C4312, L (Ch. 350)

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

PROPER
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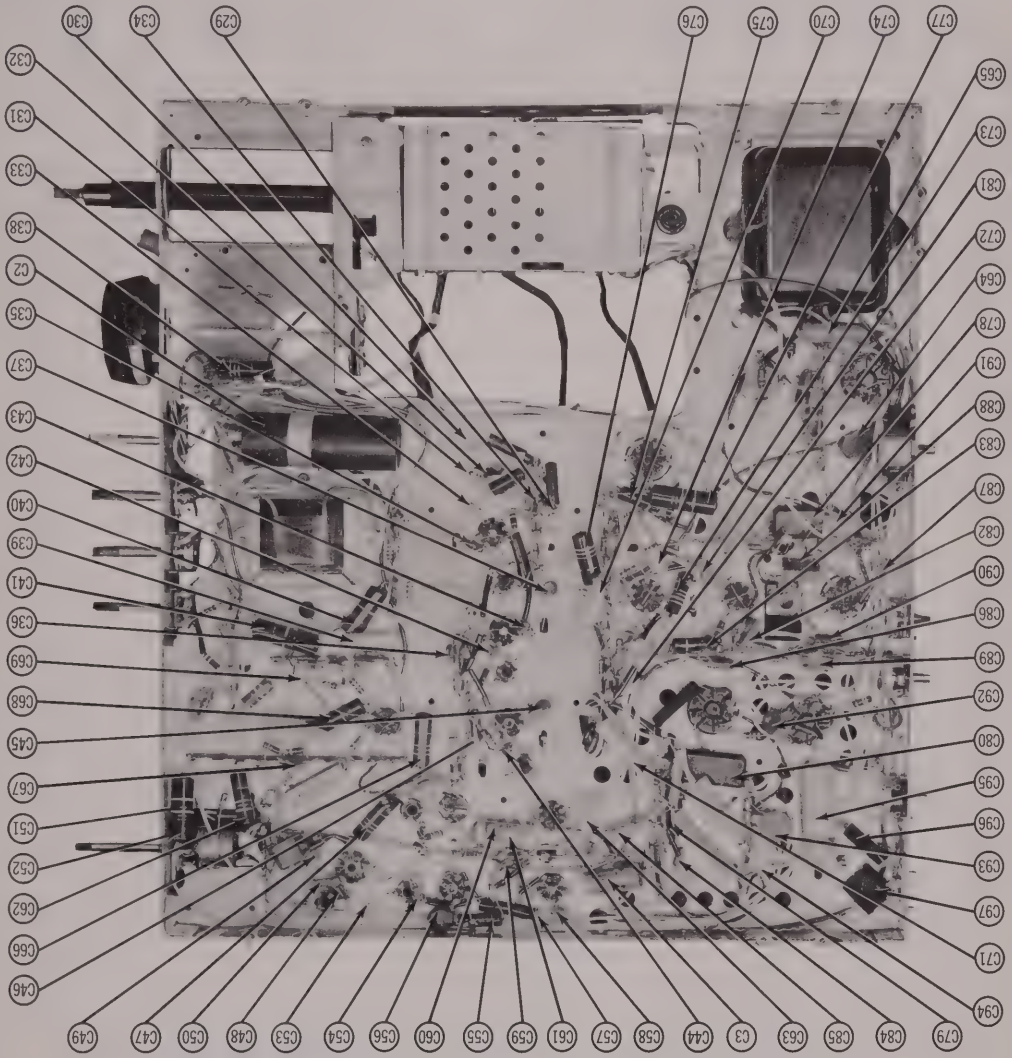

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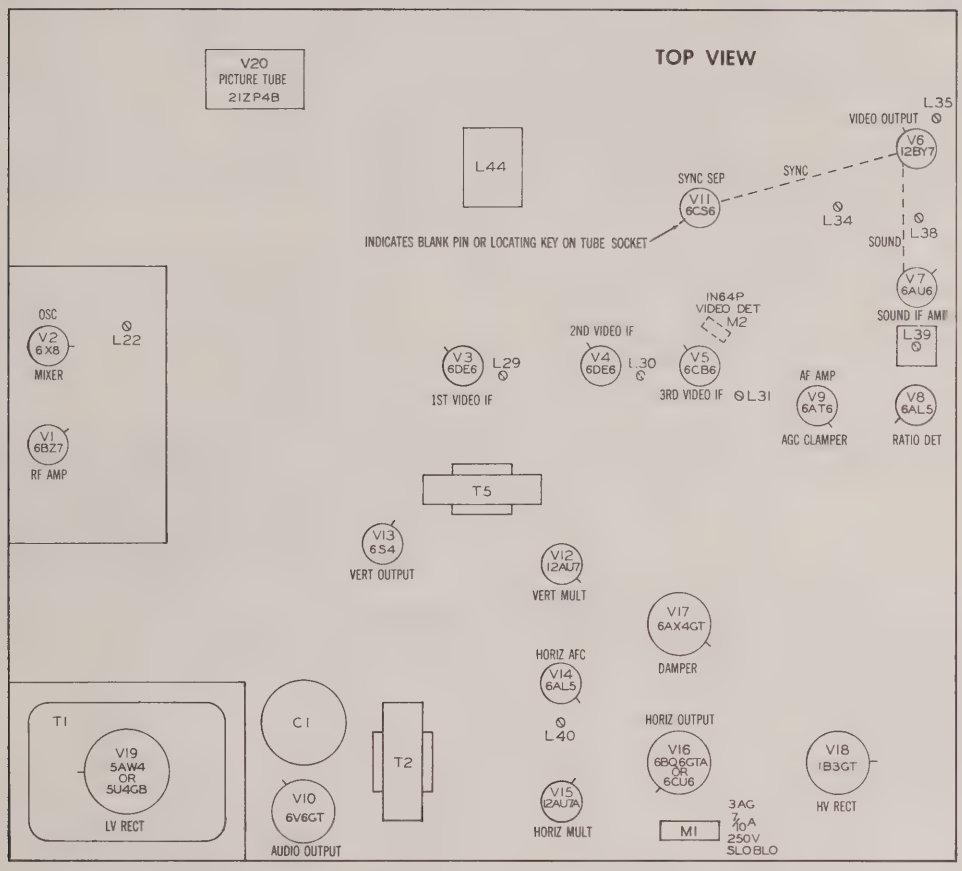
TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V19, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V6**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V6, V20**
Has pic, no sound - **V7, V8, V9, V10**
Overloaded picture - **V9**

SYNC FAILURE
No vert. sync - **V11, V12**
No horiz. sync - **V11, V14, V15**
No vert. or horiz. sync - **V11**

SWEEP FAILURE
No raster, has sound - **V15, V16, V17, V18, V20**
No vertical deflection - **V12, V13**
Poor vert. linearity or foldover - **V12, V13**
Poor horiz. linearity or foldover - **V15, V16, V17**
Narrow picture - **V15, V16, V17, V18, V19**
Vert. off freq. - **V11, V12**
Horiz. off freq. - **V11, V14, V15**

PHILCO MODELS 22C4016, L, 22C4124, L, 22C4126, L, 22C4129, 22C4312, L (Ch. 350)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Allow 15 minutes for receiver and test equipment to warm up. There must be a good bond between chassis and test equipment.
Connect the deflection yoke and speaker during alignment.
Do not remove the horizontal oscillator tube (V15) to disable the high voltage. The high voltage lead should be securely taped and kept away from the chassis. The IF shield must be in place.

VIDEO IF ALIGNMENT

Set the contrast and brightness control fully counter clockwise.
Connect the negative lead of a 14 volt battery thru 10KΩ to point Ⓐ. Positive lead to chassis.
Set the channel selector to channel 4 position.
Attenuate generator during alignment for 4 volts peak to peak output at point Ⓑ.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	Marker to point Ⓒ. Low side to chassis.	Not used.	47.25MC (400∿ 30% Mod)	4	Vert. amp. thru 15KΩ to point Ⓑ. Low side to chassis.	A1	Adjust for MINIMUM 400∿ indication on scope.
2.	"	"	"	41.25MC	"	"	A2	"
3.	"	"	"	45.4MC	"	"	A3, A4	Adjust for maximum 400∿ indication on scope.
4.	"	"	"	43.0MC	"	"	A5	"
5.	"	"	"	42.7MC	"	"	A6	"
6.	"	" "	"	44.4MC	"	"	A7	"
7.	Fig. 1	Across antenna input thru matching network. (Fig. 1)	69MC (6MC Swp)	67.25MC 70.25MC	"	"		Set fine tuning control at its mid-range position. Check response curve similar to Fig. 2 for curve limits. If necessary, re-adjust A3 thru A7 for response curve limits as in Fig. 2. Adjust A3 and A4 for proper curve level. Adjust A7 to level curve top. Adjust A6 for proper slope of curve on low frequency side. Readjust adjustments SLIGHTLY. If unable to obtain proper response curve, repeat steps 3 thru 7. Do not reset A1 and A2.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (±1%) resistors in series from point Ⓓ to chassis. The junction of these two resistors is alignment point Ⓗ as shown on the schematic.
Remove 6DE6 (V3, 1st video IF tube) from its socket.
Set the volume control for normal volume.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	2200Ω carbon resistor	High side to point Ⓑ. Low side to chassis.	4.5MC (Unmod)	Any	DC probe to point Ⓓ. Common to chassis.	A8, A9	Adjust for maximum deflection.
9.	"	"	"	"	DC probe to point Ⓔ. Common to point Ⓗ.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Replace V3 in its socket.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Remove 6DE6 (V3, 1st video IF tube) from its socket.
Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	2200Ω carbon resistor	High side to point Ⓑ. Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. amp. to point Ⓓ. Low side to chassis.	A8, A9	Disconnect stabilizing capacitor C3. Increase generator output for reading on scope. Adjust for curve of maximum amplitude and symmetry similar to Fig. 3
9.	"	"	"	"	"	Vert. amp. to point Ⓔ. Low side to chassis.	A10	Reconnect stabilizing capacitor C3. Increase generator output for reading on scope. Adjust so that 4.5MC occurs at crossover lines as shown in Fig. 4. SLIGHTLY readjust A9 for maximum amplitude and straightness of crossover lines. Replace V3 in its socket.

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	2200Ω carbon resistor	High side to point Ⓑ. Low side to chassis.	4.5MC (Unmod)	Any	DC probe to pin 11 (cathode) of picture tube. Common to chassis.	A11	Remove V3 from its socket. Adjust for MINIMUM deflection. Replace V3 in its socket.

ALTERNATE 4.5MC TRAP ADJUSTMENT

Tune in a TV station and turn the fine tuning control clockwise until a 4.5MC beat pattern appears in picture. Adjust A11 for minimum 4.5MC beat in picture.

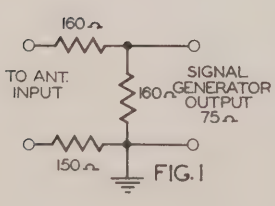


FIG. 1

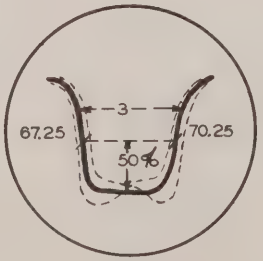


FIG. 2

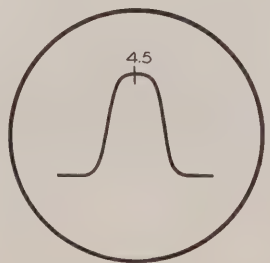


FIG. 3

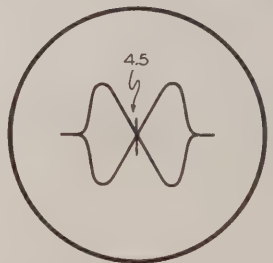


FIG. 4

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3844 MEADE ST.
DENVER, COLORADO

ALIGNMENT INSTRUCTIONS (cont)

OSCILLATOR ALIGNMENT

Disconnect white lead going to tuner AGC from main chassis. Connect negative lead of a 1.5 volt battery to loose end. Positive lead to chassis.
Set the fine tuning control at its mid-range position.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	Not used.	257MC 251MC 245MC 239MC	13 12 11 10	Vert. amp. thru 1KΩ to point Ⓒ. Low side to tuner chassis.	A12 A13 A14 A15	Adjust for zero beat on scope. If regeneration occurs, increase bias to 3 volts if necessary.
12.	"	"	"	233MC 227MC	9 8	"	A16	Adjust A16 for channel 9 frequency. Then recheck A16 for channel 8 frequency. Recheck A16 for channel 9. If necessary, make compromise between channel 8 and 9 for zero beat on scope.
13.	"	"	"	221MC	7	"	A17	Adjust A17 for zero beat on scope. Recheck steps 11, 12 and 13. If necessary, readjust until channels are within 500KC of their proper frequencies.
14.	"	"	"	129MC	6	"	A18	Adjust for zero beat on scope.
15.	"	"	"	113MC	4	"	A19	"
16.	"	"	"	101MC	2	"	A20	"

RF AND MIXER ALIGNMENT

Connect bias as in "Oscillator Alignment". Disconnect tuner coupling link at the IF terminal strip near V3 and solder a 68Ω resistor to the open end of the lead from the tuner. Remove V3 from its socket. Adjust scope controls so that the width is double the height.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
17.	Fig. 1.	Across antenna terminals thru antenna matching network. (Fig. 1)	213MC (10MC Swp)	213MC	13	Vert. amp. thru 1KΩ to point Ⓕ. Low side to tuner chassis.	A21, A22	Check for response similar to Fig. 5. If response is not flat between limits shown, detune A22 counter clockwise until single peak appears. Adjust A21 until peak falls on 213MC marker. Adjust A22 for response similar to Fig. 5.
18.	"	"	177MC (10MC Swp)	177MC	7	"	A23, A24	Check for response indicated by dotted lines in Fig. 6A and 6B. If necessary, adjust for mirror image of original response curve. (Tilt in opposite direction.) If response curve appears as in Fig. 6A, adjust A23 and A24 until curve appears as in Fig. 6B. This adjustment over compensates to allow for channel 13 adjustment. Repeat steps 17 and 18 until centered and symmetrical response curves are obtained on channels 7 and 13.
19.	"	"	85MC (10MC Swp)	85MC	6	"	A25, A26, A27	Adjust for symmetrical response approximately center of bandpass. Adjust A26 counter clockwise until single peak appears. Adjust A25 until peak falls on 85MC marker. Adjust A27 for maximum curve amplitude and symmetry of single peak. Retouch SLIGHTLY, if necessary, A25 and A26 for symmetrical response centered at approximately the 85MC marker point similar to Fig. 5.
20.	"	"	44MC (10MC Swp)	44MC	UHF position	"	A25, A26, A27	Check response curve for symmetrical response centered at approximately 44MC. If necessary, retouch SLIGHTLY A25, A26 and A27 for symmetrical response centered at approximately the 44MC marker point. Repeat step 19 to be sure channel 6 (85MC) is within proper limits on response curve similar to Fig. 5.

VIDEO PEAKING COIL ADJUSTMENT

In cases of excessive overshooting or smear on some stations, it may be necessary to adjust A28. Alignment of the tuner and IF portions of the receiver must be correct before this adjustment is made. Proper adjustment of A28 is the point of minimum smear and trailing whites. After adjusting A28 on one channel, check other channels to make certain picture quality has not been affected.

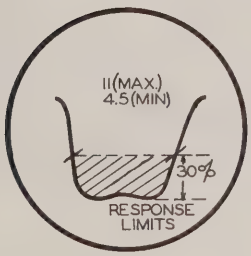


FIG. 5

FIG. 6A

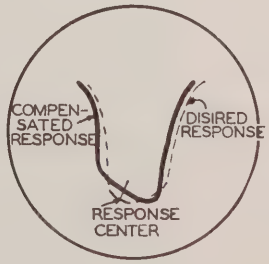
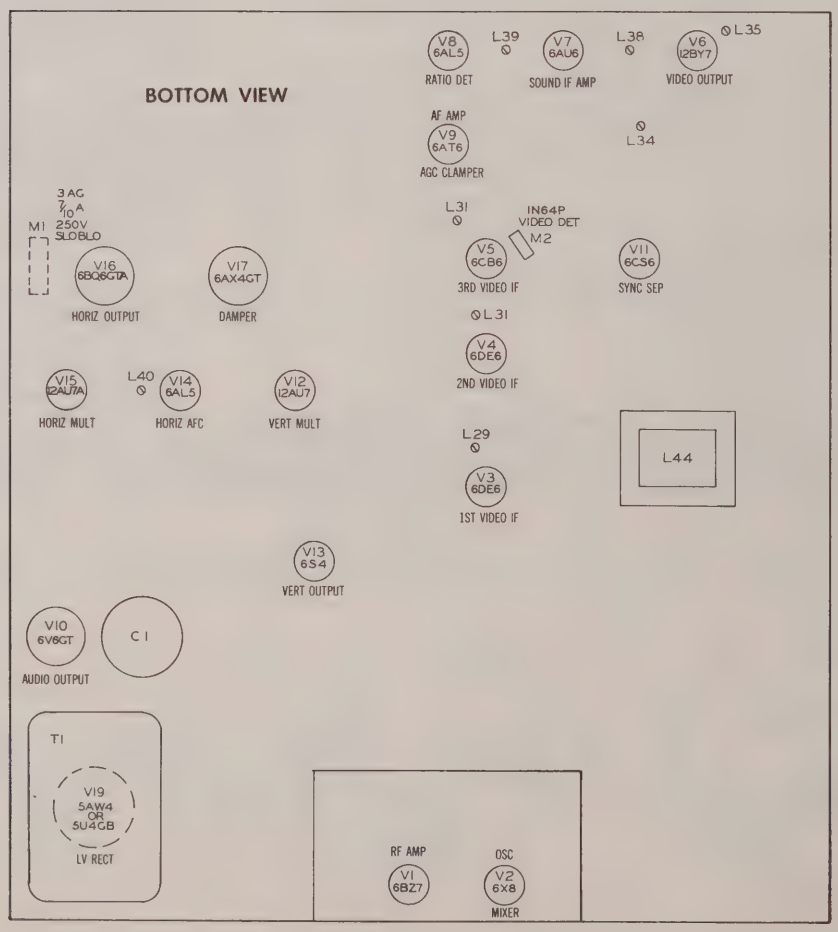


FIG. 6B

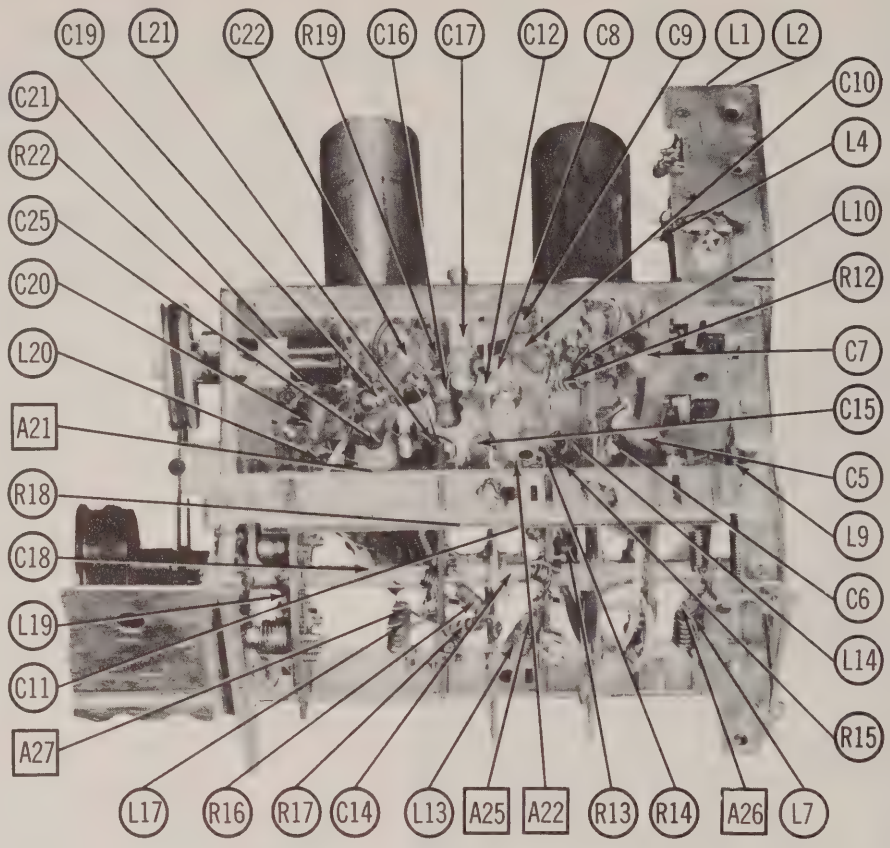
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BZ7	†2KΩ	†250KΩ	INF	0Ω	.1Ω	INF	2Meg	0Ω	0Ω
V 2	6X8	0Ω	22KΩ	†50KΩ	0Ω	.1Ω	0Ω	100KΩ	†16.5KΩ	†8.4KΩ
V 3	6DE6	470KΩ	47Ω	.1Ω	0Ω	†5KΩ	†5KΩ	0Ω		
V 4	6DE6	470KΩ	68Ω	.1Ω	0Ω	†12KΩ	†12KΩ	0Ω		
V 5	6CB6	.1Ω	220Ω	.1Ω	0Ω	†5KΩ	†5KΩ	0Ω		
V 6	12BY7	22Ω	1Meg	0Ω	.1Ω	.1Ω	0Ω	†4.2KΩ	†13KΩ	0Ω
V 7	6AU6	4Ω	0Ω	0Ω	.1Ω	†20KΩ	†20KΩ	330Ω		
V 8	6AL5	0Ω	33KΩ	0Ω	.1Ω	INF	NC	INF		
V 9	6AT6	10Meg	0Ω	.1Ω	0Ω	470KΩ	2Meg	†220KΩ		
V 10	6V6GT	NC	.1Ω	†500Ω	†0Ω	470KΩ	TP	0Ω	820Ω	
V 11	6CS6	1Meg	0Ω	.1Ω	0Ω	†40KΩ	†15KΩ	2Meg		
V 12	12AU7	†150KΩ	1Meg	680Ω	.1Ω	.1Ω	▲2.3Meg	3Meg	680Ω	0Ω
V 13	6S4	NC	0Ω	2.2Meg	.1Ω	0Ω	2.2Meg	NC	NC	▲9KΩ
V 14	6AL5	1Meg	2Meg	0Ω	.1Ω	1Meg	NC	0Ω		
V 15	12AU7A	†50KΩ	150KΩ	1.2KΩ	.1Ω	.1Ω	†20KΩ	6Meg	1.2KΩ	0Ω
V 16	6BQ6GTA	TP	0Ω	TP	†8KΩ	1.3Meg	TP	.1Ω	0Ω	Top Cap ▲26Ω
V 17	6AX4GT	TP	NC	60KΩ	NC	†1.8Ω	NC	.1Ω	0Ω	
V 18	1B3GT	PINS 1 - 8 HAVE INFINITE RESISTANCE								Top Cap ▲835Ω
V 19	5AW4	INF	20KΩ	INF	26Ω	INF	28Ω	INF	20KΩ	
V 20	21ZP4B	0Ω	470KΩ	Pin 10 ▲8.2KΩ	Pin 11 †180KΩ	Pin 12 .1Ω				

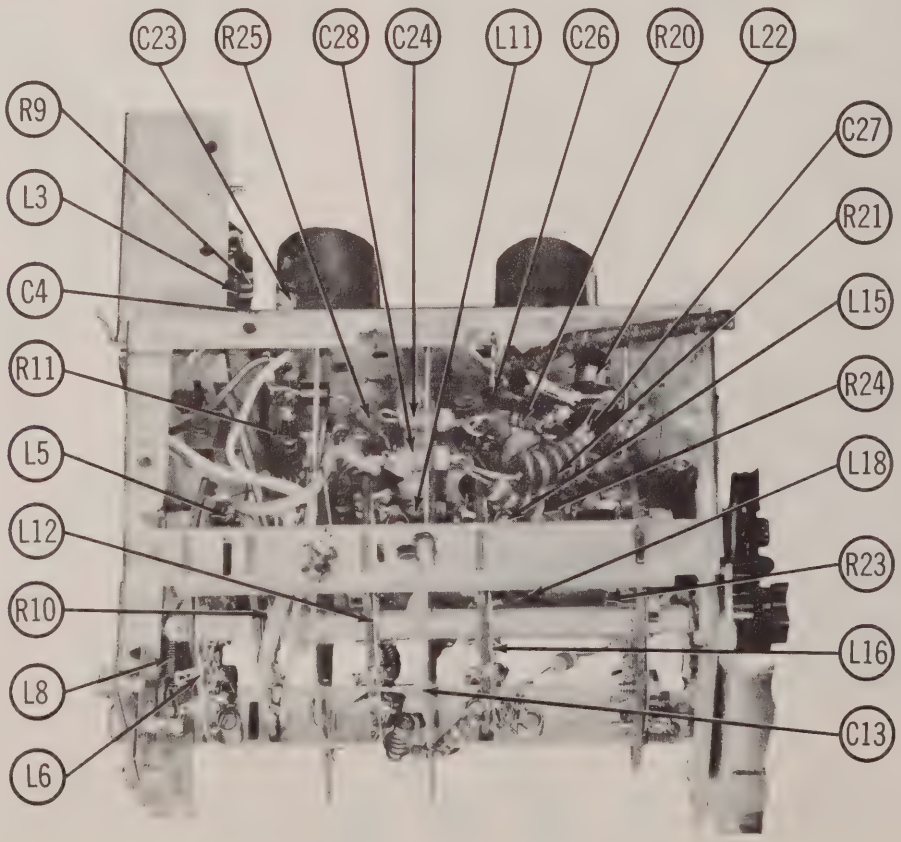
† MEASURED FROM PIN 2 OF V19.
▲ MEASURED FROM PIN 3 OF V17.
TP - TIE POINT
NC - NO CONNECTION



TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

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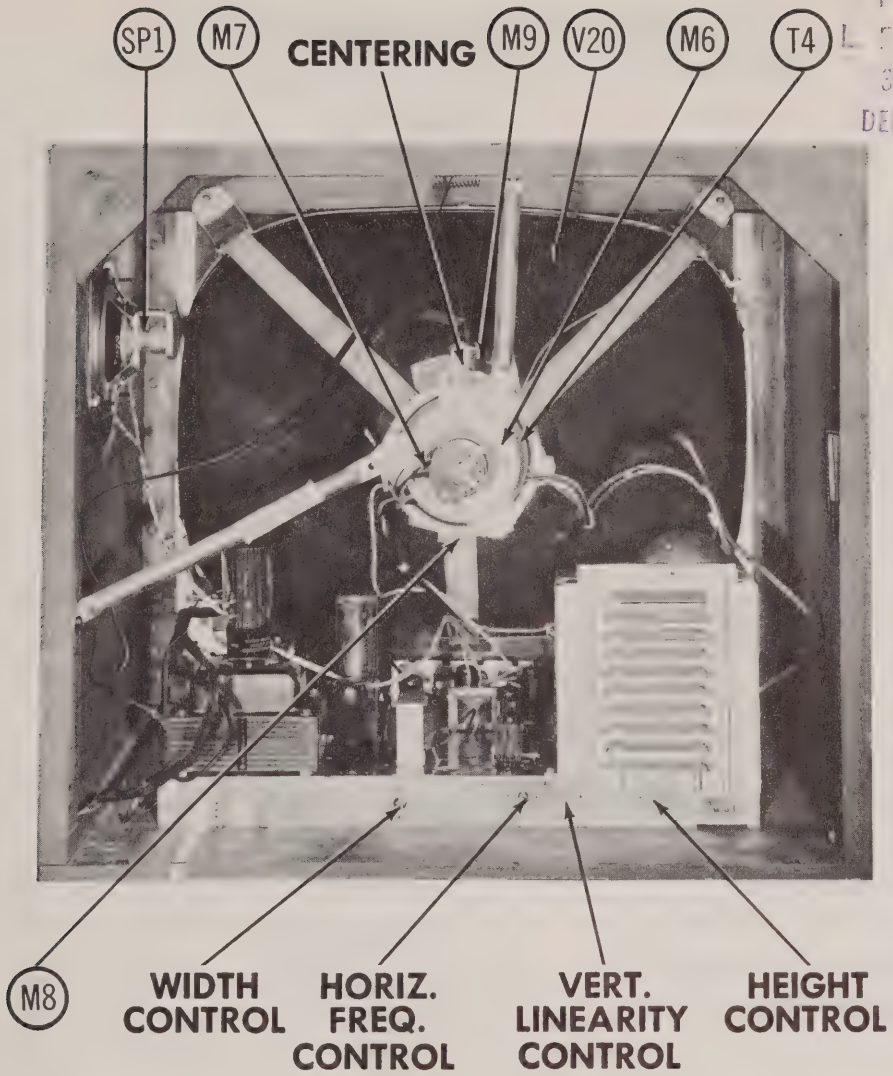

CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Tune in a TV station, preferably a test pattern.

Reduce the picture width until approximately one inch of blank screen appears on each side of the picture.

Increase the brightness control setting until the blanking time becomes visible as indicated by a dark bar at each side of the picture.

Connect a .1MFD capacitor from point Ⓖ to chassis.

Set the horizontal hold control at the center of its range.

Adjust the horizontal frequency control until the picture is centered between the two blanking bars.

Remove the .1MFD capacitor.

Adjust the horizontal oscillator coil slug (B1) until the picture is again centered between the two blanking bars.

Rotate the horizontal hold control thru its range. The picture should lose sync at both extremes of rotation. If it does not, readjust the horizontal frequency control until that condition is obtained.

Check the number of diagonal bars on either side of the pull in range of the horizontal hold. There should be 1 or 2 bars present. If proper pull-in is not obtained, repeat the above procedure.

Adjust the horizontal width control for a picture slightly wider than necessary to fill picture mask horizontally.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss Of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V16, V17 and V19. Check R112, R5, R108, C92 and other associated components. Check T2 and T4A.

DRIVE LINES

Check by substitution V16 and V17. Check R106, R112, R5, C91, C92, T2 and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V16 and V17. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V15, V16 and V17. Check C87 for open. Check L41, C88, R102, R101, R104 and other associated components.

XMAS TREE EFFECT

Check by substitution V15, V16 and V17. Check T2 and T4 for internal arcing. Check L41, C88, C90, C92, C84, C85, C83, R101, R105 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V12 and V13. Check waveform W7.

If Satisfactory	If Unsatisfactory
Check T3, T4B, R114 and other associated components.	Check R87, R89, R8, C73, C77 and other associated components.

INSUFFICIENT SWEEP

Check by substitution V12 and V13. Check height and vertical linearity controls for proper operation. Check T3, R89 and other associated components.

COMPRESSED AT BOTTOM

Check by substitution V12 and V13. Check R89, R8, R109, C73, C77 and other associated components.

COMPRESSED AT TOP

Check by substitution V12 and V13. Check R7, R109, R110, C78, T3 and other associated components.

FOLDS

Check by substitution V12 and V13. Check C75, C76, C77, R90 and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Substitute V11. Check C67, C68, R76, R80, R77 and other associated components.

LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY

Substitute V13. Check vertical integrator network. Check C73, R88, R87, R3 and other associated components.

LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY

Check by substitution V14 and V15. Check horizontal AFC network. Check C81, C88, C89, L41, R103, R6, R4 and other associated components.

HORIZONTAL BENDING

Check by substitution V11, V14 and V15. Check horizontal AFC network.

VIDEO

LOSS OF VIDEO

Substitute V6. Check C47, C52, R52, R49, R48, L37 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A11. Check video IF alignment.

POOR CONTRAST

Substitute V6. Check L32, L33, L34, L38, R48, R50, R51, C47, C50, C52 and other associated components.

NEGATIVE PICTURE

Substitute V6. Check picture tube. Check L34, L38, C51, C47, C52 and other associated components.

SMEAR

Substitute V6. L32, L33, L35, L38, C47, C52 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V1, V3, V4, V5 and V6 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V7, V8, V9, and V10. Check stages V9 and V10 using audio signal generator. Apply audio signal across R1B.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF stages for component failure or change of value.	Check C61, C63, C64, C65, R70, T5, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A10 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak Or No Sound".

POWER

DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, substitute V19, Check M1 fuse. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Substitute V19. Check B+ filter and decoupling network.

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DENVER, COLORADO

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: PHILCO PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amplifier	6BZ7	6BZ7	9AJ	
V2	Osc.-Mixer	6X8	6X8	9AK	
V3	1st. Video IF Amp.	6DE6	6DE6	7CM	
V4	2nd. Video IF Amp.	6DE6	6DE6	7CM	
V5	3rd. Video IF Amp.	6CB6	6CB6	7CM	
V6	Video Output	12BY7	12BY7	9BF	
V7	Sound IF Amp.	6AU6	6AU6	7BK	
V8	Ratio Detector	6AL5	6AL5	6BT	
V9	AF Amplifier-AGC Clamper	6AT6	6AT6	7BT	
V10	Audio Output	6V6GT	6V6GT	7S	
V11	Sync Separator	6CS6	6CS6	7CH	
V12	Vert. Mult.	12AU7	12AU7	9A	
V13	Vert. Output	6S4	6S4	9AC	
V14	Horiz. AFC	6AL5	6AL5	6BT	
V15	Horiz. Mult.	12AU7A	12AU7A	9A	
V16	Horiz. Output	6BQ6GTA	6BQ6GTA	6AM	6BQ6GT and 6CU6 used as alternates
V17	Damper	6AX4GT	6AX4GT	4CG	
V18	HV Rectifier	1B3GT	1B3GT	3C	
V19	LV Rectifier	5AW4	5AW4	5T	5U4GB used as alternate

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: PHILCO PART No.	CBS-HYTRON PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.	RETMA BASE TYPE	NOTES
V20	21ZP4B ① 21XP4A	21ZP4B ① 21ZP4A 21ZP4 ② 21XP4A 21XP4	21ZP4B ① 21ZP4A	21ZP4B ① 21ZP4A 21ZP4 ② 21XP4A 21XP4	21ZP4B ① 21ZP4A 21ZP4 ②	12N 12N 12D 12L 12L	① Aluminized ② Circuit changes necessary

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	PHILCO PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C1A	■130	350	30-2584-41				TM-4122	S-230	
B	10	350						Q-075	
C	▲30	475							
D	▲10	350							
C2	40	400	30-2568-62			FP146	TM-40-400	S-270	
C3	2	50	30-2417-7			TC302	TD-2-50	MMT-0505	
C4	20		62-02030911	TCZ-20	NP0K-200	ZT-542			
C5	33			D6-330	GP1K-330	UC-5433			
C6	1000		30-1245-6	MFT-1000					
C7	220		62-122001001	D6-221	GP2K-221	UC-5322			
C8	.5-3		31-6520-3	829-3	3115-01-0R5	CT565A			
C9	150		62-11500101l	D6-151	GP2K-151	UC-5315			
C10	150		62-11500101l	D6-151	GP2K-151	UC-5315			
C11	150			D6-151	811-151	UC-5315			
C12	.62								
C13	1.2								
C14	3.3			TCZ-3.3	NP0A-3R3	ZT-5533			
C15	15			D6-150	GP1K-150	UC-5415			
C16	27			D6-270	GP1K-270	UC-5427			
C17	.5-3		31-6520-3	829-3	3115-01-0R5	CT565A			
C18	2.2		30-1221-6	TCZ-2.2	NP0A-2R2				
C19	1.5			TCZ-1.5	NP0A-1R5	ZT-5515			
C20	12				N330K-120				
C21	12				N330K-120				
C22	220		62-122001001	D6-221	GP2K-221	UC-5322			
C23	1000		30-1245-6	MFT-1000					
C24	1000		30-1245-6	MFT-1000					
C25	7.5		30-1224-37						
C26	10000		30-1238-2	DD-103	811-01	DC-511			
C27	680		62-16800101l	D6-681	GP2K-681	UC-5368			
C28	1000		30-1245-6	MFT-1000					
C29	1-5		31-6520-9	829-6					Note 1
C30	1-5		31-6520-9	829-6					
C31	1-5		31-6520-9						Note 1
C32	5								
C33	1-5		31-6520-9	829-6					
C34	1500		30-1238-15	DD-152	801-0015	DC-5215		C-1215	
C35	680		30-1238-7	D6-681	GP2K-681	UC-5368		K-1368	
C36	1500		30-1238-15	DD-152	801-0015	DC-5215		C-1215	
C37	1500		30-1238-15	DD-152	801-0015	DC-5215		C-1215	
C38	.047	200	30-4650-45	DF-503		PT4147	IMP2-S47	3304147	
C39	.01	200	30-4650-41	D6-103	GP2-333-103	PT411	IMP4-S1	330411	
C40	.1	200	30-4650-47	DF-104		PT401	IMP2-P1	330201	
C41	.15	200				PT4015	IMP2-P15	3302015	
C42	680		30-1238-7	D6-681	GP2K-681	UC-5368		K-1368	
C43	33		62-033009001	D6-330	GP1K-330	UC-5433		K-1433	
C44	680		30-1238-7	D6-681	GP2K-681	UC-5368		K-1368	
C45	1500		30-1238-15	DD-152	801-0015	DC-5215		C-1215	
C46	5		30-1224-28	D6-050	GP1K-050	ZT-555		K-1550	
C47	.047	200	30-4650-45	DF-503		PT4147	IMP2-S47	3302147	
C48	680		30-1238-7	D6-681	GP2K-681	UC-5368		K-1368	
C49	.01	100	30-4650-41	D6-103	GP2-333-103	PT411	IMP4-S1	330411	
C50	68		62-06840901l	D6-680	GP1K-680	UC-5468		K-1468	
C51	39		62-03940901l	D6-390	GP1K-390	UC-5439		K-1439	
C52	.1	400	30-4650-47	DF-104		PT401	IMP4-P1	330401	
C53	3.3		31-1221-9	TCZ-3.3	NP0A-3R3	ZT-5533			
C54	18		62-018300001	D6-180	GP1K-180	UC-5418		K-1418	
C55	.0022	400	30-4650-54	D6-222	GP2-333-222	PT6222	IMP6-D22	3306222	
C56	5000		30-1238-1	DD-502	811-005	DC-525		C-1250	
C57	3.3		31-1221-9	TCZ-3.3	NP0A-3R3	ZT-5533			
C58	330		62-133001001	D6-331	GP2K-331	UC-5333		K-1333	
C59	150		62-115001001	D6-151	GP2K-151	UC-5315		K-1315	
C60	1500		30-1224-28	DD-152	801-0015	DC-5215		C-1215	
C61	.1	200	30-4650-47	DF-104		PT401	IMP2-P1	330201	
C62	.047	200	30-4650-45	DF-503		PT4147	IMP2-S47	3302147	

PROPERT
L. F. BLANKEN
330 MEADE ST.
DE[illegible], COLORADO

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	PHILCO PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
			REPLACEMENT DATA						
C62	10000		30-1238-3	DD-103	811-01	DC-511	IMPE-81	330611	
C64	10000		30-1238-3	DD-103	811-01	DC-511	IMPE-81	330611	
C65	.022	600	30-4650-60	DF-303	817-03	TF4122	IMPE-822	3306122	
C66	.047	300	30-4650-43	DF-303		TF4147	IMP4-847	3304147	
C67	330		63-13300001	D6-331	GP2K-331	UC-5333		K-1333	
C68	.022	400	30-4650-43	DF-303	817-03	TF4122	IMPE-822	3304122	
C69	.1	300	30-4650-47	DF-304		TF4197	IMP3-P1	330201	
C70	.0047	300	30-4650-56	D6-473	GP2-333-472	TF6147	IMP8-D47	3306247	
C71	.022	300	30-4650-43	DF-303	817-03	TF4122	IMPE-822	3304122	
C72	.022	300	30-4650-43	DF-303	817-03	TF4122	IMPE-822	3304122	
C73	.0033	400	30-4650-55						
C74	.022	300	30-4650-44			TF4123	IMPE-83	3306123	
C75	.01	400	30-4650-41	D6-103	GP2-333-103	TF411	IMP4-81	330411	
C76	.047	400	30-4650-45	DF-303		TF4147	IMP4-847	3304147	
C77	.1	400	30-4650-47	DF-304		TF4197	IMP4-P1	330401	
C78	.1	300	30-4650-47	DF-304		TF4201	IMP3-P1	330201	
C79	.022	400	30-4650-43	DF-303	817-03	TF4122	IMP4-822	3304122	
C80	.047	400	30-4650-45	DF-303		TF4147	IMP4-847	3304147	
C81	68		63-06840001	D6-680	GPIK-680	UC-5468		K-1468	
C82	120	500	60-10125237	TCZ-120	NPO-333-121			SR-1212	
C83	.001	400	63-31000011	D6-102	GP2L-102	TF821	IMP8-D1	330621	
C84	22			D6-220	GP1K-220	UC-5422		K-1422	
C85	.0047	200	30-4650-56	D6-472	GP2-333-472	TF6147	IMP6-D47	3306247	
C86	1000		63-02309001	D6-102	GP2L-102	UC-521	IMP8-D1	K-1310	
C87	10000		30-1238-7	DD-103	811-01	DC-511	IMPE-81	330611	
C88	2200	500	60-20225434					CR-1222	
C89	82	500	60-00825437					KR-1482	
C90	390	500	60-10395437			MCB343		CR-1339	
C91	390	500	60-10395437			MCB343		CR-1339	
C92	5000		30-1238-1	DD-502	811-005	DC-525		C-1250	
C93	10000		30-1238-3	DD-103	811-01	DC-511			
C94	.047	400	30-4650-45	DF-303		TF4147	IMP4-847	3304147	
C95	.47	100	30-4671-68			TF4047	IMP3-P47	3302047	
C96	.01	600	30-4650-58	D6-103	GP2-333-103	TF611	IMP6-81	PC-0611	
C97	.01	600	30-4650-58	D6-103	GP2-333-103	TF611	IMP6-81	PC-0611	

Note 1. Not used in some versions.

CONTROLS

ITEM No	RATING RESISTANCE	RATING WATTS	PHILCO PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No	INSTALLATION NOTES
			REPLACEMENT DATA					
R1A	15KΩ	½	33-5573	*QJ-642	RTV-515		UET968	Contrast tapped at 10KΩ - Panel
B	250KΩ	½						Volume & Sw. tapped at 150KΩ Rear
R2A	100KΩ	½	33-5572-9	QU-128	A47-100K-S	B-40	U-41	Brightness
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A
R3A	3Meg	½	33-5572-14	QU-140	A47-3Meg-S	B-94	U-59	Vert. Hold
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R3A
R4A	50KΩ	½	33-5572-8	QU-123	A47-50K-S	B-31	U-35	Horiz. Hold
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R4A
R5	12.5KΩ	2	33-5574	WK-12500			R18ML	Width (Wire wound)
R6A	250KΩ	½	33-5572	QU-150	A47-250K-S	AB-50	SU-48	Horiz. Freq.
B	Shaft		Not Req.	Not Req.	FXS-1/4	Not Req.	AK-1	Attach to R6A
R7A	2.5Meg	½	33-5572-1	QU-138	A47-2.5Meg-S	SX-83	U-255	Vert. Linearity
B	Shaft		Not Req.	Not Req.	FXS-1/4	Not Req.	Not Req.	Attach to R7A
R8A	2.5Meg	½	33-5572-1	QU-139	A47-2.5Meg-S	SX-83	U-255	Height
B	Shaft		Not Req.	Not Req.	FXS-1/4	Not Req.	Not Req.	Attach to R8A

* CONCENTRIKIT EQUIVALENT: KIT K-2, BASE ELEMENTS & SHAFTS: R1A-1AK & R1-128 (PANEL)
R1B-1KQ & R1-215 (REAR)
78-1 SWITCH

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	PHILCO PART No	IRC PART No.	NOTES
			REPLACEMENT DATA		
R9	470KΩ	½		BTS-470K	
R10	150KΩ	½		BTS-150K	
R11	33KΩ	½		BTS-33K	
R12	470KΩ 5%	½		BTS-470K 5%	
R13	180KΩ	1		BTA-180K	
R14	470KΩ 5%	½		BTS-470K 5%	
R15	68Ω	½		BTS-68	
R16	1500Ω	½		BTS-1500	
R17	3700Ω	½		BTS-3700	
R18	100KΩ	½	66-4108340	BTS-100K	
R19	8200Ω	½		BTS-8200	
R20	8200Ω	2		BTS-8200	
R21	22KΩ	½	66-4228340	BTS-22K	
R22	150KΩ	½		BTS-150K	
R23	47KΩ	1		BTA-47K	
R24	220Ω	½		BTS-220	
R25	220Ω	½		BTS-220	
R26	10000Ω	½	66-4108340	BTS-10K	
R27	1Meg 5%	½	66-5108240	BTS-1Meg 5%	
R28	1Meg	½	66-5108340	BTS-1Meg	
R29	12KΩ	½	66-4128340	BTS-12K	
R30	1000Ω	½	66-4108340	BTS-1000	
R31	47Ω	½	66-4478240	BTS-47	
R32	220Ω	½	66-4228340	BTS-220	
R33	220Ω	½	66-4228340	BTS-220	
R34	2200Ω	7	33-1335-95	PW10-5000	
R35	18KΩ	½	66-4188340	BTS-18K	
R36	1000Ω	½	66-4108340	BTS-1000	
R37	68Ω	½	66-4068340	BTS-68	
R38	220Ω	½	66-4228340	BTS-220	
R39	12KΩ	2	66-4128340	BTS-12K	
R40	220Ω	½	66-4228340	BTS-220	
R41	220Ω	½	66-4228340	BTS-220	
R42	6800Ω	½	66-4688340	BTS-6800	
R43	3900Ω	½	66-4398340	BTS-3900	
R44	27KΩ	½	66-4278340	BTS-27K	
R45	470KΩ	½	66-4478340	BTS-470K	
R46	1Meg	½	66-5108340	BTS-1Meg	
R47	22Ω	2	66-0228340	BTS-22Ω	
R48	33KΩ	2	66-3338340	BTS-33K	
R49	39KΩ	½	66-3398340	BTS-39K	
R50	47KΩ	½	66-4478340	BTS-47K	
R51	5200Ω	7	33-1335-95	PW10-5000	
R52	22000Ω 5%	½	66-6228340	BTS-22K 5%	
R53	5600Ω	½	66-2568340	BTS-5600	
R54	150KΩ	½	66-4158340	BTS-150K	
R55	220KΩ	½	66-4228340	BTS-220K	
R56	180KΩ	½		BTS-180K	
R57	220KΩ	½	66-4228340	BTS-220K	
R58	56KΩ	½		BTS-56K	
R59	510KΩ 5%	½	66-4518240	BTS-510K 5%	
R60	10Meg 5%	½	66-5108240	BTS-10Meg 5%	
R61	10Meg	½	66-5108340	BTS-10Meg	
R62	330Ω	½		BTS-330	
R63	15KΩ	½		BTS-15K	
R64	47Ω	½	66-0478340	BTS-47	
R65	270Ω	½	66-1278340	BTS-270	
R66	22KΩ	½	66-3228340	BTS-22K	
R67	33KΩ	½	66-3338340	BTS-33K	
R68	10KΩ	½	66-3108340	BTS-10K	
R69	10Meg	½	66-5108340	BTS-10Meg	
R70	220KΩ	½	66-4228340	BTS-220K	
R71	470KΩ	½	66-4478340	BTS-470K	
R72	82Ω	2	66-1828340	BTS-330	
R73	150KΩ	½		BTS-150K	
R74	680KΩ	½	66-4688340	BTS-680K	
R75	390KΩ	½	66-4398340	BTS-390K	
R76	12KΩ	2	66-3128340	BTS-12K	
R77	82000Ω	½	66-5828340	BTS-8200	
R78	680KΩ	½	66-4688340	BTS-680K	
R79	470KΩ	½		BTS-470K	
R80	220KΩ	½	66-4228340	BTS-220K	
R81	27KΩ	½	66-3278340	BTS-27K	
R82	82000Ω	½	66-5828340	BTS-8200	
R83	8200Ω	½	66-3828340	BTS-8200	
R84	1Meg	½	66-5108340	BTS-1Meg	
R85	1.5Meg	½	66-5158340	BTS-1.5Meg	
R86	6800 5%	½	66-1688240	BTS-680 5%	
R87	150KΩ	½	66-4158340	BTS-150K	
R88	1.5Meg	½	66-5158340	BTS-1.5Meg	
R89	1Meg	½	66-5108340	BTS-1Meg	
R90	82000Ω	½	66-5828340	BTS-8200	
R91	1Meg	½	66-5108340	BTS-1Meg	
R92	470KΩ	½	66-4478340	BTS-470K	
R93	1000Ω	½		BTS-1000	
R94	1000Ω	½		BTS-1000	
R95	1Meg	½	66-5108340	BTS-1Meg	
R96	1Meg	½	66-5108340	BTS-1Meg	
R97	47KΩ	1		BTA-47K	
R98	220KΩ	½	66-4228340	BTS-220K	
R99	4.7Meg	½	66-5478340	BTS-4.7Meg	
R100	1800Ω	½	66-3188340	BTS-1800	
R101	15KΩ	½	66-3158340	BTS-15K	
R102	47000Ω	½	66-3478340	BTS-4700	
R103	56KΩ	½		BTS-56K	
R104	39KΩ	½		BTS-39K	
R105	47KΩ	½	66-3478340	BTS-47K	
R106	10KΩ	½	66-3108340	BTS-10K	
R107	1Meg	½	66-5108340	BTS-1Meg	
R108	1Meg	½	66-5108340	BTS-1Meg	
R109	470KΩ	½		BTS-470K	
R110	820KΩ	½	66-4828340	BTS-820K	
R111	120KΩ	½	66-4128340	BTS-120K	
R112	5000Ω	7	33-1335-95	PW10-5000	
R113	39KΩ	2	66-3398340	BTS-39K	
R114	8300Ω	7			
R115	4.7Ω	1	66-0478340		
R116	100KΩ	½	66-4108340	BTB-100K	

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	PHILCO PART No.	Stancor PART No	Merit PART No.	Triad PART No.	RCA TYPE No.	Hallderson PART No	Thordarson PART No
				REPLACEMENT DATA						
T1	117VAC ① L 8A	530VCT 240ADC	5VCT ② 3A	32-8857						
	SEC 3	SEC 4	SEC 5							
	6.3VAC ③ 8.4A									

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	PHILCO Part No	Hallderson Part No	Merit PART No	RCA TYPE No	Ram PART No	Stancor PART No	Thordarson PART No	Triad PART No
		REPLACEMENT DATA							
T2	Horiz. Output Trans.	32-8653-1		HVO-2①		X022* ②	A-8230* ③	F1.Y-27* ④	
T3	Vert. Output Trans.	32-8658	Z1904	A-3037	232T1	V313	A-823	26852	A-103X
T4A	Yoke-Horiz. (30MH)	32-9670 ⑤	DF804 ①	MDF-71①		Y70F30 ①	DY-12A ①	Y-12 ①	Y-24 ①
B	Vert. (40MH)								

① Use original yoke damping network.
② Fabricate new mounting bracket.
③ Includes resistor R93 and R94.
④ Drill new mounting hole(s).

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL (CONNECTIONS)	Hallderson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
4	8	4	4	4	4		
12	3	5	3	3			
2	2	2	2	2	2		
6	6	6	6	6	6		
1	1	1	1	1	1		
8	7	7	7	7	8		
7	8	8	8	8	7		

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	PHILCO Part No.	Stancor PART No.	Merit PART No.	Triad PART No.	Hallderson PART No.	Thordarson PART No.	NOTES
			REPLACEMENT DATA						
T5	4, 5KΩ	3, 3Ω Tap④ .25Ω Res. Feed-back	33-8653						

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V C IMP	PHILCO PART No	JENSEN PART No	QUAM PART No	NOTES
				REPLACEMENT DATA			
SP1	5"	PM	3.3Ω	36-1639-13	ST-105	5A1	① Speaker used in models 22C4016 & 22C4016L
				36-1639-9 ①	Mod. P5-X		② Speaker used in models 22C4124 & 22C4124L
	8"	PM	3.3Ω	36-1651-5 ②	ST-115	8A2	2. Speaker used in models 22C4126, 22C4126L,
				36-1651-11①	Mod. P8-V		22C4312 & 22C4312L

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	PHILCO PART No.	MAISSNER PART No.	MERIT PART No.	MULLER PART No.	NOTES
				REPLACEMENT DATA				
L1	VHF Ant. Match. Trans	.4Ω	0Ω					
L2	VHF Ant Match. Trans.	.4Ω	0Ω					
L3	FM Trap	.3Ω						
L4	IF Trap	0Ω						
L5	VHF Ant. Coil	0Ω						Channel 13
L6	VHF Ant. Coils	0Ω						
L7	VHF Ant. Coil	0Ω						Channel 6
L8	UHF IF Interstage Coil	0Ω						
L9	UHF IF Interstage Coil	0Ω						
L10	Mesa Coil	0Ω						
L11	VHF RF Coil	0Ω						Channel 13
L12	VHF RF Coils	0Ω						
L13	VHF RF Coil	0Ω						Channel 6
L14	UHF Coil	0Ω						
L15	VHF Mixer Grid Coil	0Ω						Channel 13
L16	VHF Mixer Grid Coils	0Ω						
L17	VHF Mixer Grid Coil	0Ω						Channel 6
L18	UHF Coil	0Ω						
L19	VHF Osc. Coil	0Ω						
L20	RF Choke	0Ω						
L21	RF Coil	0Ω						
L22	1st Video IF	0Ω						Tapped
L23	47.25MC Trap	.4Ω		32-4597-11				
L24	41.25MC Trap	.1Ω		32-4597-11				
L25	IF Trap	.4Ω						Not used in some versions
L26	RF Coil	0Ω			19-1001		4804	1.7 Microhenries, not used in some versions
L27	Video IF Coupling Coil	.1Ω		32-4597-3	19-1001	TV-189	6178	.84 Microhenry
L28	Pil. Choke	.1Ω		32-4112-49	19-1003		6806	3 Microhenries
L29	2nd. Video IF	.1Ω	.1Ω	32-4486-41	17-4533	TV-130	6319	
L30	3rd. Video IF	.1Ω	.1Ω	32-4486-42	17-4532	TV-130	6319	
L31	4th. Video IF	.1Ω	.1Ω	32-4486-43	17-4534	TV-130	6319	
L32	Series Peaking Coil	1.4Ω		32-4113-53	19-1003		6806	3 Microhenries
L33	Series Peaking Coil	8.2Ω		32-4422-27	19-1005		6813	10 Microhenries, IRC part CL-1
L34	Series Peaking Coil	3.3Ω		32-4497-22	19-1315		6153	125 Microhenries
L35	Variable Shunt Peaking Coil	10.5Ω		32-4480-5	19-1313		6180	300-600 Microhenries
L36	4.5MC Trap	1.6Ω		32-4483-3	20-1004	TV-151	1469	
L37	Shunt Peaking Coil	6.5Ω		32-4480-4	19-1310	TV-185	6181	250 Microhenries
L38	Series Peaking Coil	3.9Ω		32-4480-9	19-1310	TV-184	6180	190 Microhenries
L39	Sound IF	5Ω		32-4483-10	17-1412			
L40	Ratio Det.	5Ω	.70CT	32-4480-6A	17-1497	TV-115	6306	Tertiary winding - .7Ω
L41	Horiz. Osc.	160Ω		32-4557-3	19-1576	TV-183	6310	
L42	RF Choke	1.8Ω		32-4112-50	19-1005		6812	10 Microhenries
L43	RF Choke	1.8Ω		32-4112-50	19-1005		6812	10 Microhenries
L44	RF Choke	1.8Ω		32-4112-50	19-1005		6812	10 Microhenries
L45	Pil. Choke	.1Ω		32-4112-49	19-1003		6806	3 Microhenries

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE @ CURRENT 1000 (~)	PHILCO PART No.	Stancor PART No	Merit PART No.	Triad PART No.	Hallderson PART No.	Thordarson PART No.
				REPLACEMENT DATA					
L46	.230ADC	400	1.85HY	32-8655					

FUSES

ITEM No	TYPE	RATING	PHILCO PART No FUSE	PHILCO PART No HOLDER	LITTELFUSE PART No FUSE	LITTELFUSE PART No HOLDER	BUSS PART No FUSE	BUSS PART No HOLDER
			REPLACEMENT DATA					
M1	3AG S/B	7/10A 250V	AD-2346-15	76-4519-2	313, 750 (3AG-3/4A-S/B)	357001	MDL 7/10	4405

CRYSTAL DIODES

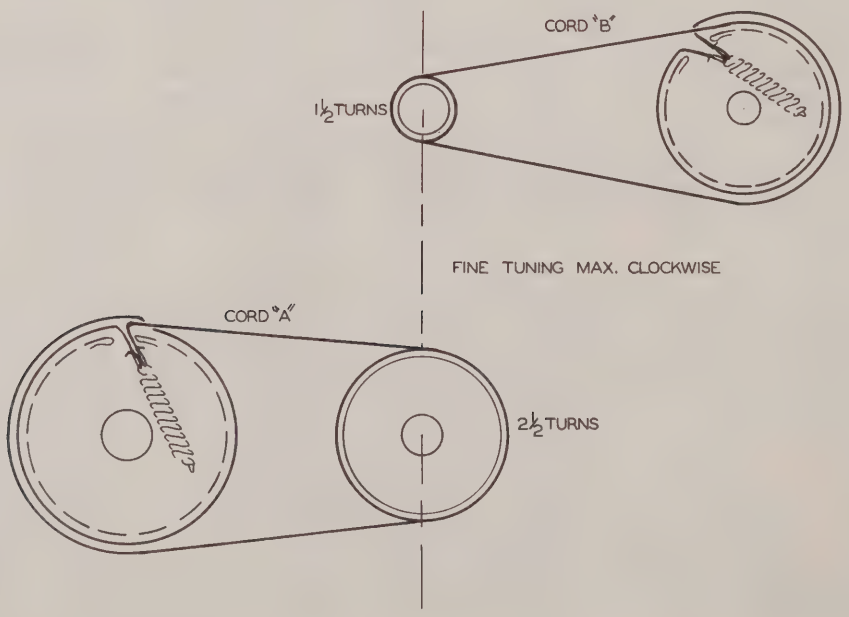
ITEM No	ORIG TYPE	PHILCO PART No	SYLVANIA PART No	NOTES
		REPLACEMENT DATA		
M3	1N54P	34-8022	1N60 or 1N132	Video Det.

PHILCO MODELS 22C4016, L, 22C4124, L, 22C4126, L, 22C4129, 22C4312, L (Ch. 350)

PARTS LIST AND DESCRIPTIONS (Continued)

MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M3	Dial Light	3463-4	#1847, Bayonet
M4	Tuner	76-8946-2	VHF - Models 22C4016, 22C4016L, 22C4126, 22C4126L, 22C4312, 22C4312L
	Tuner	76-8946-1	VHF - Models 22C4124, 22C4124L
M5	Switch	42-2035	Signal Range Selector
M6	Focus Magnet	76-9014	Includes centering device
M7	Ion Trap	76-6077-2	
M8	Correction Magnet	76-8389	Short Arm (Bottom side of picture tube)
M9	Correction Magnet	76-6594	Long Arm (Top side of picture tube)
	Cabinet	11052-1	Model 22C4016L
	Cabinet	11060-1	Model 22C4124L
	Cabinet	11098-1	Model 22C4126L
	Cabinet	11070-1	Model 22C4312L
	Cabinet	11052	Model 22C4016
	Cabinet	11060	Model 22C4124
	Cabinet	11098	Model 22C4126
	Cabinet	11070	Model 22C4312
	Knob	54-6140-1	Brightness - Model 22C4016
	Knob	54-6140-3	Brightness - Models 22C4016L, 22C4124L, 22C4126L, 22C4312L
	Knob	54-6140-1	Brightness - Models 22C4124, 22C4126, 22C4312
	Knob	76-9118	VHF Channel Selector - Models 22C4016, 22C4124, 22C4126, 22C4312
	Knob	76-9118-1	VHF Channel Selector - Models 22C4016L, 22C4124L, 22C4126L, 22C4312L
	Knob	76-6213-6	Contrast - All models
	Knob	76-6104-5	Fine tuning - Models 22C4016, 22C4016L, 22C4124, 22C4124L
	Knob	76-6104-9	Fine tuning - Models 22C4126, 22C4126L, 22C4312, 22C4312L
	Knob	54-6140-1	Horiz. Hold - Model 22C4016, 22C4124, 22C4126, 22C4312
	Knob	54-6140-3	Horiz. Hold - Models 22C4016L, 22C4124L, 22C4126L, 22C4312L
	Knob	54-6140-1	Vert. Hold - Models 22C4016, 22C4124, 22C4126, 22C4312
	Knob	54-6140-3	Vert. Hold - Models 22C4016L, 22C4124L, 22C4126L, 22C4312L
	Knob	54-6140	Range Selector - Models 22C4016, 22C4124, 22C4126, 22C4312
	Knob	54-6140-2	Range Selector - Models 22C4016L, 22C4124L, 22C4126L, 22C4312L
	Knob	54-6137	On-off-volume - Models 22C4016, 22C4124, 22C4126, 22C4312
	Knob	54-6137-1	On-off-volume - Models 22C4016L, 22C4124L, 22C4126L, 22C4312L
	Safety Glass	54-9213-36	Models 22C4016, 22C4016L
	Safety Glass	54-9213-37	Models 22C4124, 22C4124L, 22C4126, 22C4126L, 22C4312, 22C4312L
	Mask	28-10075-2	Model 22C4016
	Mask	28-10075-3	Model 22C4016L
	Mask	28-9376-12	Models 22C4124, 22C4126, 22C4312
	Mask	28-9376-13	Models 22C4124L, 22C4126L, 22C4312L



FINE TUNING DRIVE CORD STRINGING

PROPERTY OF
L. F. BLANKENSH...
3924 MEADE ST.
DENVER, COLORADO

TROUBLE SHOOTING AIDS (cont)

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V15, V16, V17 and V18. Check waveform W14.

If Satisfactory	If Unsatisfactory
Check T2, T4A, C94, C1C, C93, R115, R114, R112, R5 and other associated components.	Check L41, C88, C90, C92, C89, R101, R102, R105 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V16, V17 and V19. Check T2, T4A, C1C, C92, R5, R112 and other associated components.

BLOOMING

Check by substitution V16, V17, V18 and V19. Check R112, R5, C92 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss Of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak Or No Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V1, V2, V3, V4, V5 and V6. Check video IF components for failure or change of value.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

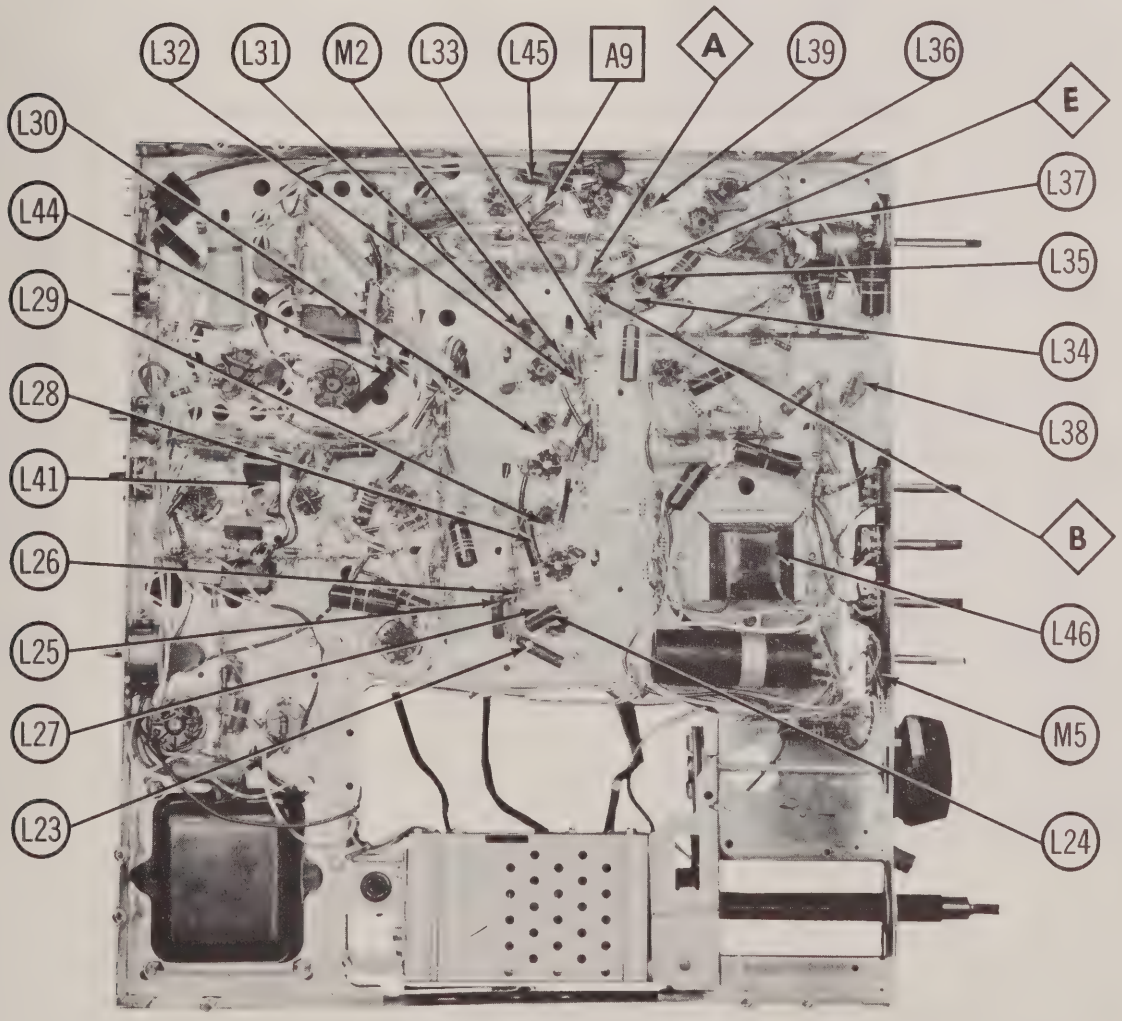
KEYSTONE EFFECT

Check T4 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR & ALIGN. IDENTIFICATION

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

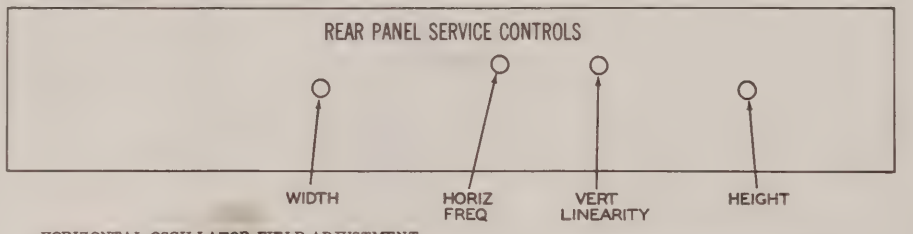
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove 3 wood screws holding metal strip at the top of the cabinet. Remove metal strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator circuit can be made from rear panel of the chassis. Set the horizontal hold control at the mid-position of its range and adjust the horizontal frequency control until picture synchronizes horizontally. If results are unsatisfactory refer to horizontal sweep circuit adjustments.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L39) located on top of chassis. (See tube placement chart for location).

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

CENTERING

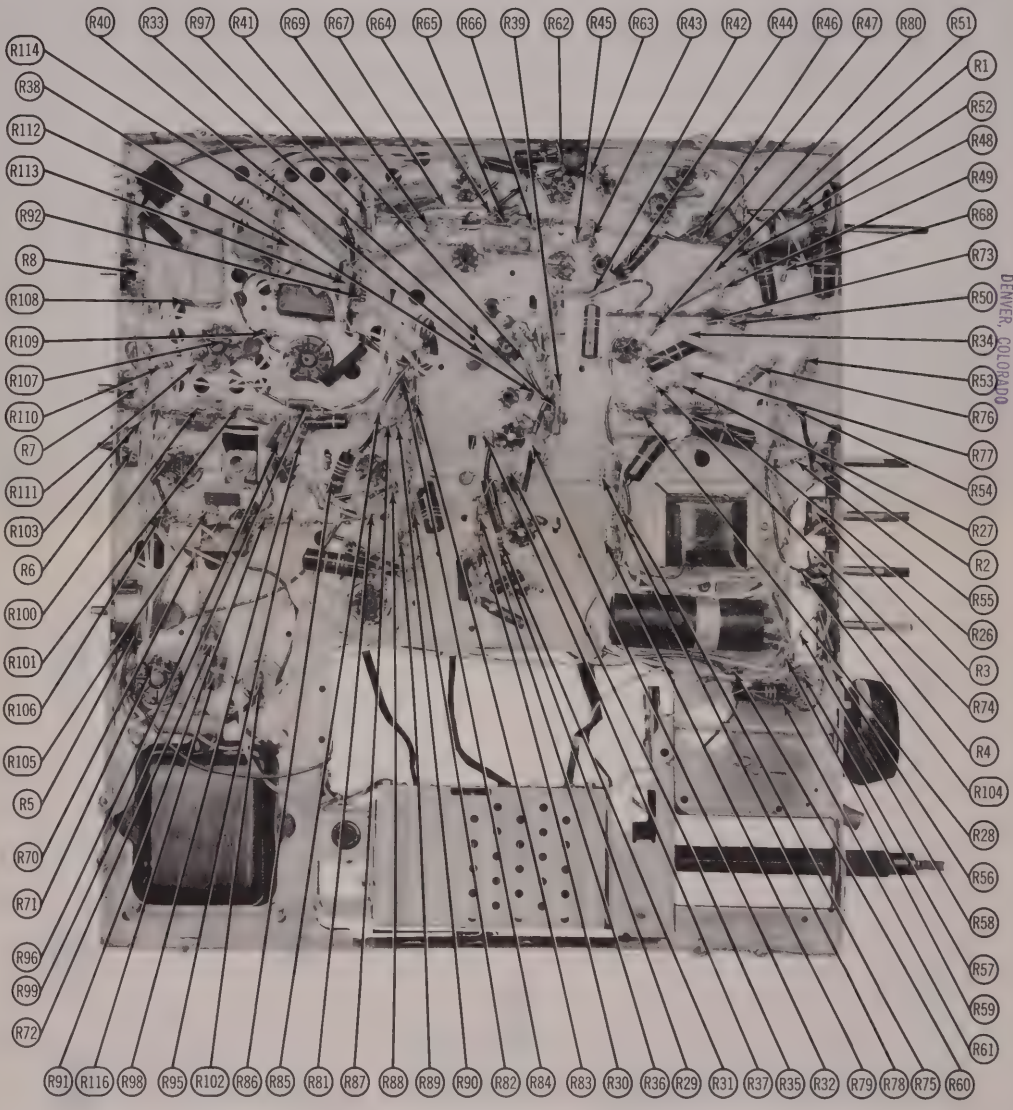
Centering is accomplished mechanically by means of a centering lever on the PM focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

ANTI-PIN CUSHION ADJUSTMENT

Reduce the picture size so that the sides of the raster are visible, and position the magnets so that all sides are straight lines and the corners are at right angles.

DISASSEMBLY INSTRUCTIONS

1. Remove 3 push-on type control knobs from front panel of cabinet.
2. Remove 2 metal screws from front control panel. Remove panel and 4 push-on type control knobs.
3. Remove 5 wood screws. Remove rear cover.
4. Disconnect deflection yoke, picture tube socket, HV lead and speaker leads.
5. Remove 6 chassis bolts. Remove chassis.
6. Remove 2 speaker nuts. Remove speaker.

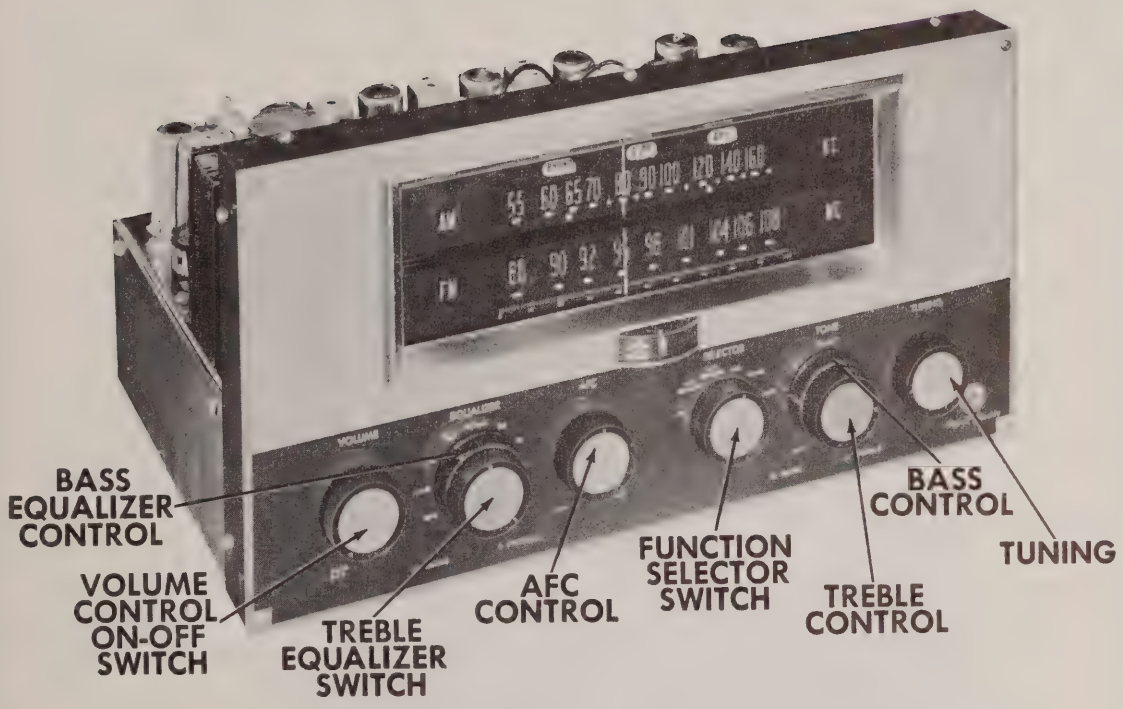


CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

L. F. [illegible]
3974 MEADE ST.
DENVER, COLORADO

PROPERTY OF
L. F. BLANKENSHIP
3924 MERGE ST.
DENVER, COLORADO

PILOT
MODEL AF-860



PILOT
MODEL AF-860

TRADE NAME	Pilot Model AF-860	
MANUFACTURER	Pilot Radio Corp., 37-06 36th St., Long Island City, N. Y.	
TYPE SET	AC Operated AM-FM Superheterodyne Tuner With Audio Pre-Amplifier	
TUBES	Twelve	
POWER SUPPLY	105-120 Volts AC-60 Cycles	RATING . 55 Amp. @ 117 Volts AC
TUNING RANGE - BROADCAST	540KC - 1700KC	FM - 88MC - 108MC

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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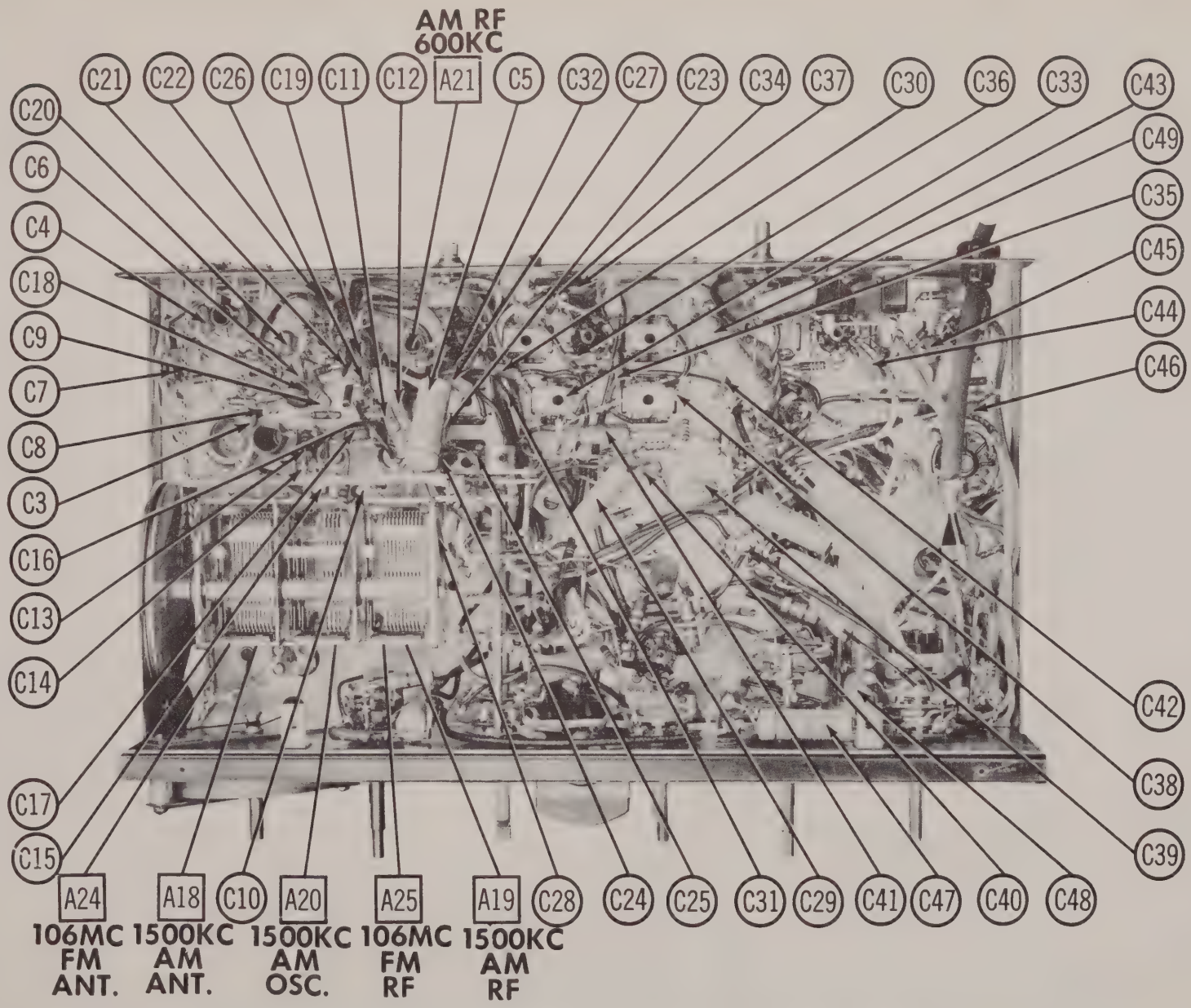
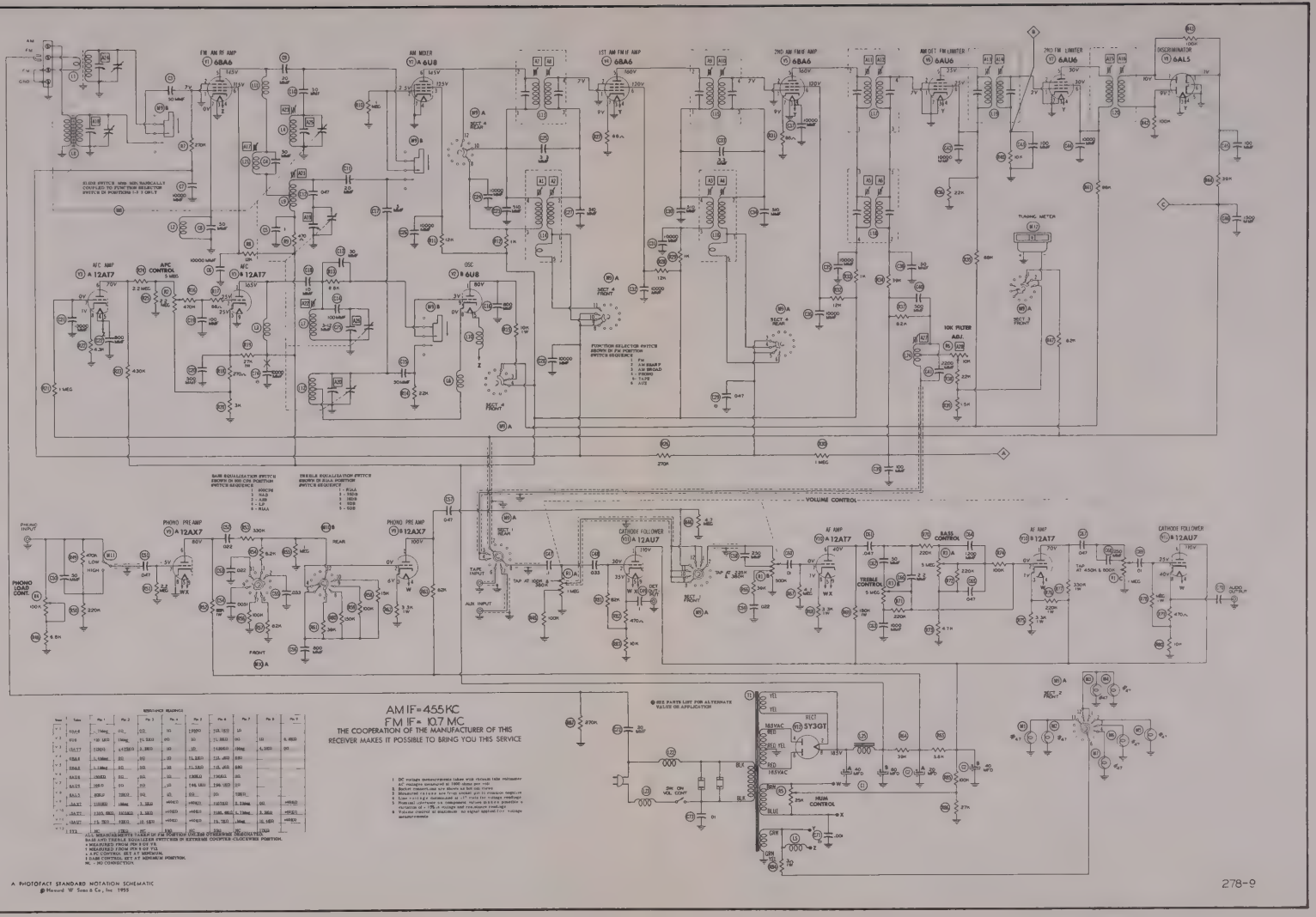
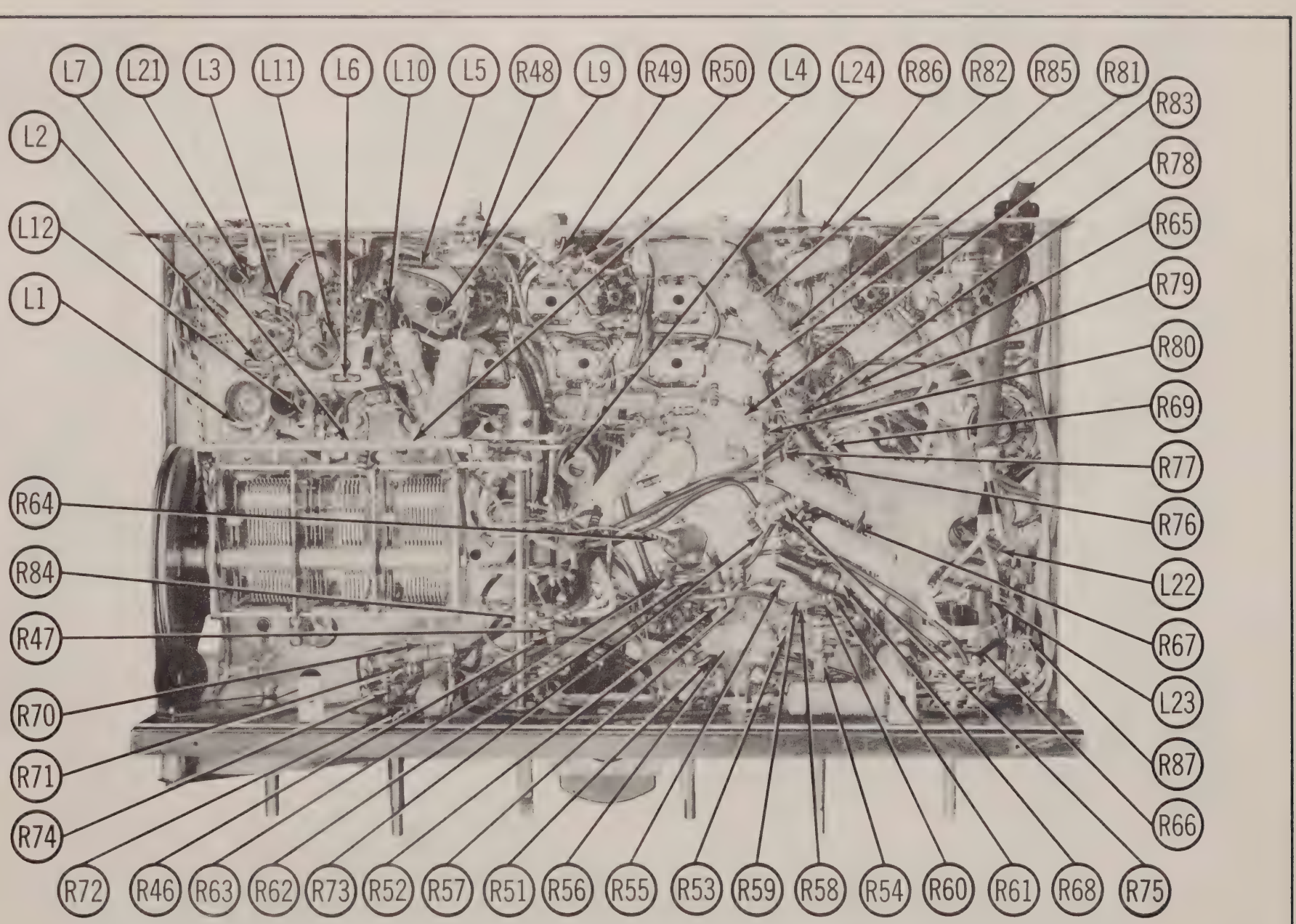
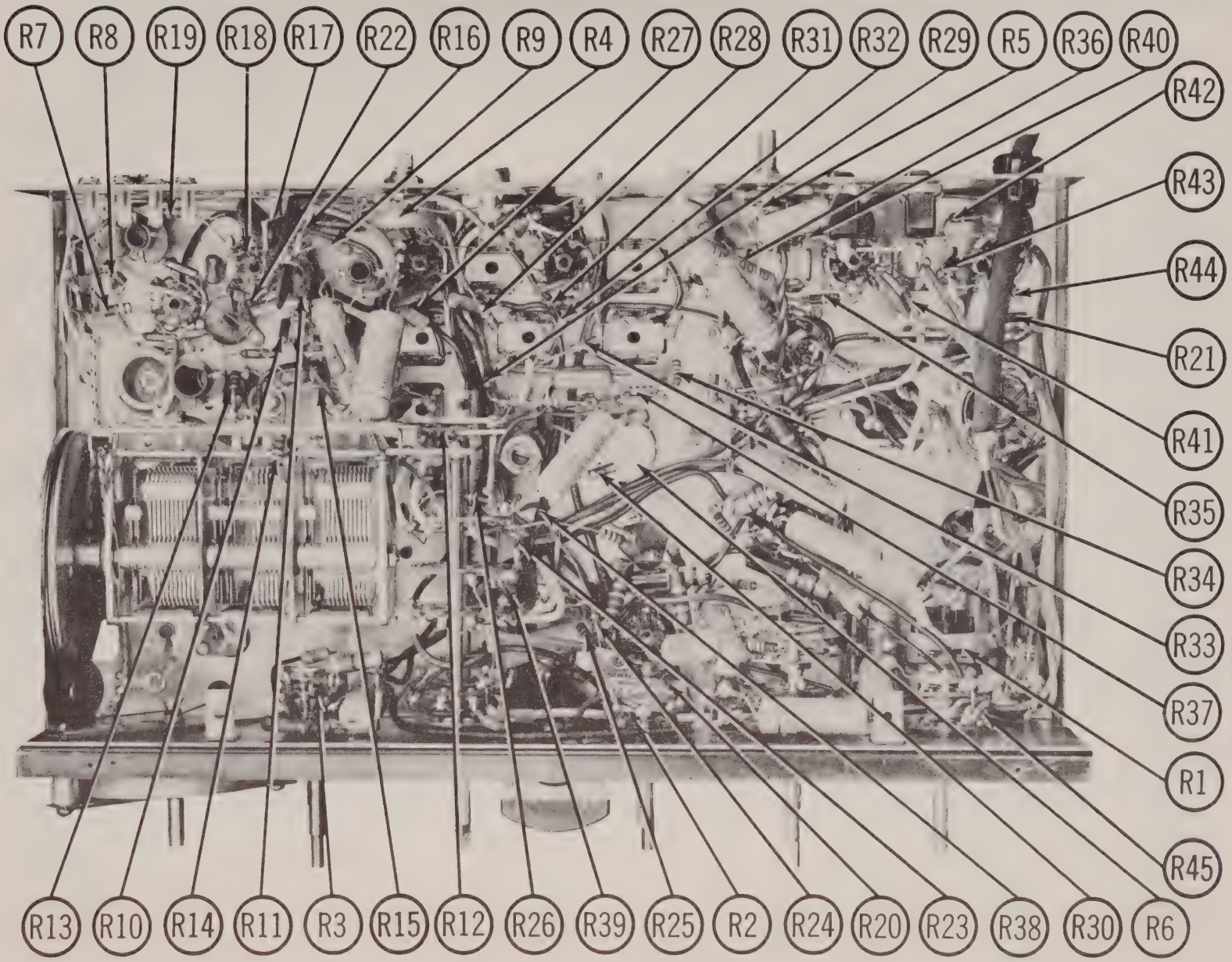


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION


AM IF = 455 KC
FM IF = 10.7 MC
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
A PHOTOFACT STANDARD NOTATION SCHEMATIC
© Howard W. Sams & Co., Inc. 1955
278-9

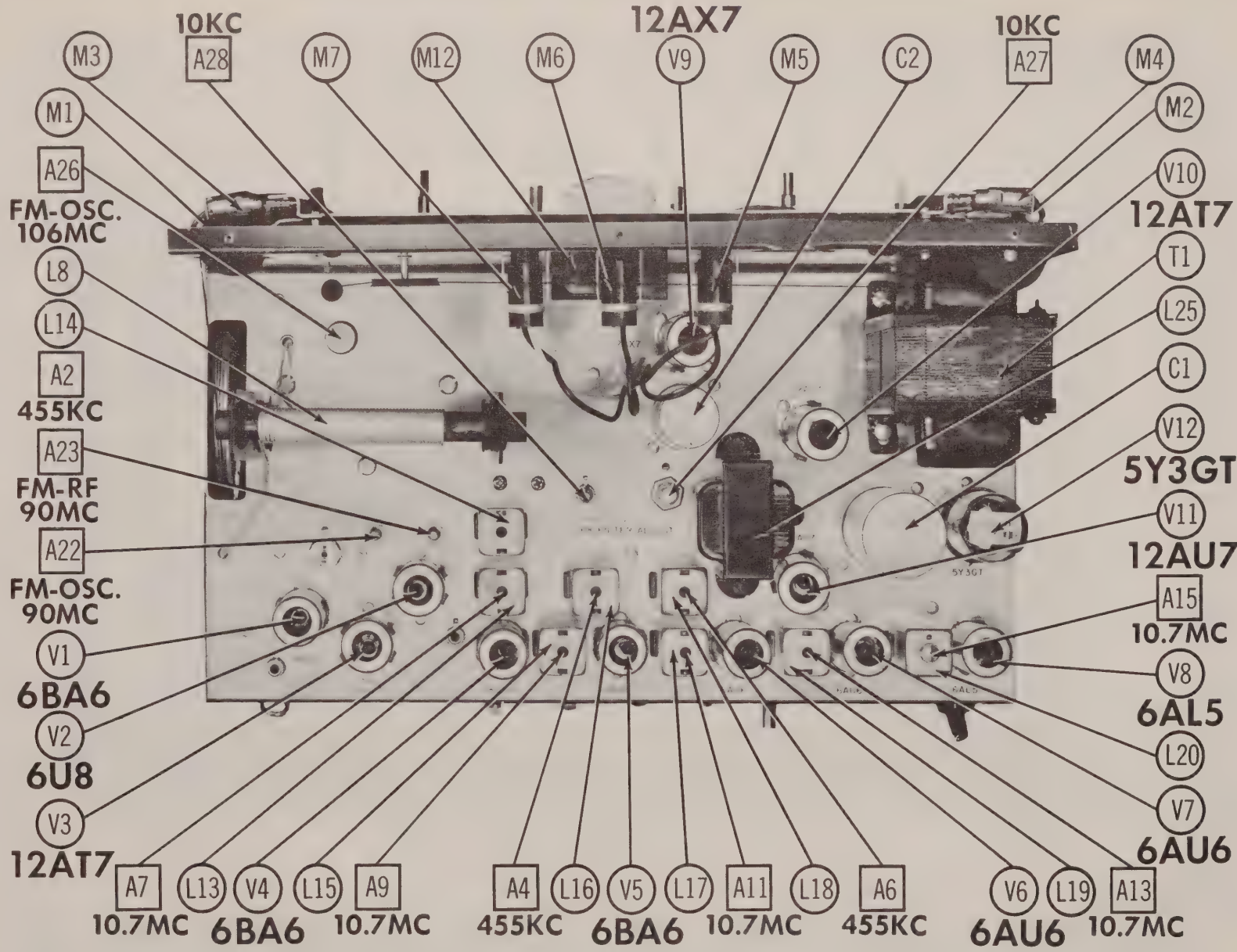


CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PROPERTY OF
ANKENSHIP
DE ST.
LORADO



CHASSIS TOP VIEW

PROPERTY OF
L. F. BLANKENSHIP
21 MEADE ST
[illegible], COLORADO

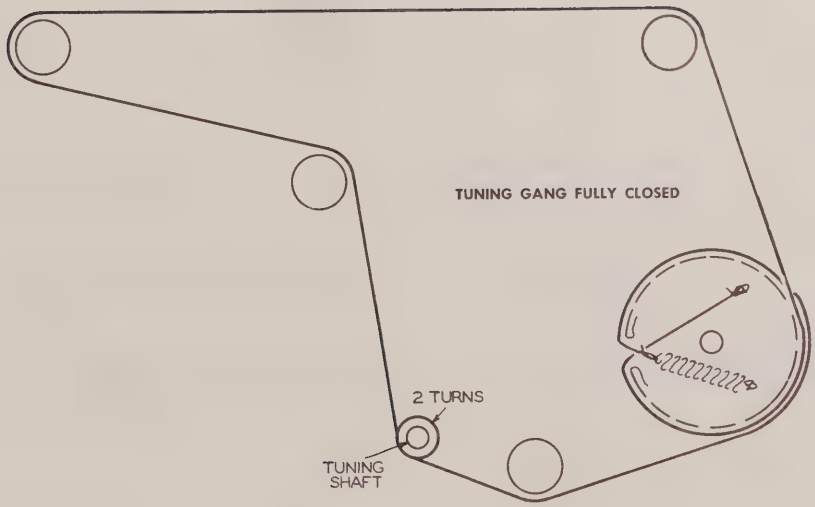
ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.
Allow a 30 minute warm-up period.

AM FM ALIGNMENT USING AM SIGNAL GENERATOR & VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.01MFD	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	455KC (400% Mod)	AM Sharp	550KC	DC probe to point (A). Common to chassis.	A1, A2, A3, A4, A5, A6	Adjust for maximum deflection.
2.	"	"	10.7MC	FM	88MC	"	A7, A8 A9, A10, A11, A12	"
3.	"	"	"	"	"	DC probe to point (B). Common to chassis.	A13, A14	"
4.	"	"	"	"	"	DC probe to point (C). Common to chassis.	A16	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
5.	"	"	"	"	"	"	A15	Adjust for maximum deflection. Repeat step 4.
6.	Direct	High side to AM Antenna terminal. Low side to chassis.	455KC	AM Sharp	550KC	DC probe to point (A). Common to chassis.	A17	Adjust for MINIMUM deflection.
7.	"	"	1500KC	"	1500KC	"	A18, A19	Adjust for maximum deflection.
8.	"	"	600KC	"	600KC	"	A21	Adjust for maximum deflection while rocking tuning gang.
9.	270Ω carbon resistor	High side to FM antenna terminal. Low side to chassis.	90MC	FM (AFC off)	90MC	"	A22, A23	Adjust for maximum deflection.
10.	"	"	106MC	"	106MC	"	A24, A25 A26	"
11.			550KC	AM Sharp	10KC	"	A27, A28	Adjust for MINIMUM deflection.



DIAL CORD STRINGING

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: PILOT PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	FM-AM RF Amp.	6BA6	6BA6	7BK	
V2	Mixer-Osc.	6U8	6U8	9AE	
V3	AFC-AFC Amp.	12AT7	12AT7	9A	
V4	1st AM-FM IF Amp	6BA6	6BA6	7BK	
V5	2nd AM-FM IF Amp.	6BA6	6BA6	7BK	
V6	AM Det-FM Limiter	6AU6	6AU6	7BK	
V7	2nd FM Limiter	6AU6	6AU6	7BK	
V8	Discriminator	6AL5	6AL5	6BT	
V9	Phono Pre-Amp.	12AX7	12AX7	9A	
V10	AF Amp.	12AT7	12AT7	9A	
V11	Cathode Follower	12AU7	12AU7	9A	
V12	Rectifier	5Y3GT	5Y3GT	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	PILOT PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	▲40	250				FP227.5	TM-8040-450	D-140	
B	▲80	250							
C2A	■20	250				FP319.8	TM-4020-250	T-090	
B	▲40	250							
C3	50			D6-500	GP1K-500	UC-545		K-1450	
C4	50			TCZ-50	NP0-338-500	ZT-545			
C5	.1	400		DF-104		PT401	IMP4-P1	330401	
C6	10000			DD-103	811-01	DC-511			
C7	10000			DD-103	811-01	DC-511			
C8	50			D6-500	GP1K-500	UC-545		K-1450	
C9	20			TCN-20	N750K-200			K-1420	
C10	50			D6-500	GP1K-500	UC-545		K-1450	
C11	20			TCN-20	N750K-200			K-1420	
C12	.047	400		DF-503		PT4147	IMP4-S47	33014147	
C13	30			TCN-30	N750K-300				
C14	100			TCA-100	N750L-101	ZT-531			
C15	50			D6-500	GP1K-500	UC-545		K-1450	
C16	800			DD-801				K-1380	
C17	5			TCN-5	N750A-050	NT-555			
C18	10			TCL-10					
C19	100			D6-101	GP1K-101	UC-531		K-1310	
C20	500			D6-501	GP1K-200	UC-535		K-1350	
C21	10000			DD-103	811-01	DC-511			
C22	800			DD-801				K-1380	
C23	510	500						KR-1351	
C24	10000			DD-103	811-01	DC-511			
C25	3.3			TCZ-3R3	NP0A-3R3	ZT-5533			
C26	10000			DD-103	811-01	DC-511			
C27	510	500						KR-1351	
C28	10000			DD-103	811-01	DC-511			
C29	.047	400		DF-503		PT4147	IMP4-S47	3304147	Note 1
C30	510	500						KR-1351	
C31	10000			DD-103	811-01	DC-511			
C32	10000			DD-103	811-01	DC-511			
C33	3.3			TCZ-3R3	NP0A-3R3	ZT-5533			
C34	510	500						KR-1351	
C35	10000			DD-103	811-01	DC-511			
C36	10000			DD-103	811-01	DC-511			
C37	10000			DD-103	811-01	DC-511			
C38	50			D6-500	GP2K-500	UC-545		K-1450	
C39	100			D6-101	GP1K-101	UC-531		K-1310	
C40	500			D6-501	GP2K-501	UC-535		K-1340	
C41	2200								
C42	10000			DD-103	811-01	DC-511			
C43	100			D6-101	GP1K-101	UC-531		K-1310	
C44	10000			DD-103	811-01	DC-511			
C45	100			D6-101	GP1K-101	UC-531		K-1310	
C46	1500			D6-152	GP2L-152	UC-5215			
C47	.1	200		DF-104		PT401	IMP2-P1	330201	

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: PILOT PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R35	68KΩ	½		BTS-68K	
R36	22KΩ	½		BTS-22K	
R37	82KΩ	½		BTS-82K	
R38	22KΩ	½		BTS-22K	
R39	1500Ω	½		BTS-1500	
R40	10KΩ	½		BTS-10K	
R41	68KΩ	½		BTS-68K	
R42	100KΩ 5%	½		BTS-100K 5%	
R43	100KΩ 5%	½		BTS-100K 5%	
R44	39KΩ	½		BTS-39K	
R45	100KΩ	½		BTS-100K	
R46	4.7Meg	½		BTS-4.7Meg	
R47	82KΩ	½		BTS-82K	
R48	6800Ω	½		BTS-6800	
R49	470KΩ	½		BTS-470K	
R50	220KΩ	½		BTS-220K	
R51	2.2Meg	½		BTS-2.2Meg	
R52	68KΩ	1		BTA-68K	
R53	330KΩ	½		BTS-330K	
R54	8200Ω 5%	½		BTS-8200 5%	
R55	1Meg	½		BTS-1Meg	
R56	100KΩ 5%	½		BTS-100K 5%	
R57	82KΩ 5%	½		BTS-82K 5%	
R58	15KΩ 5%	½		BTS-15K 5%	
R59	100KΩ 5%	½		BTS-100K 5%	
R60	150KΩ 5%	½		BTS-150K 5%	
R61	39KΩ 5%	½		BTS-39K 5%	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: PILOT PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R62	3300Ω	1		BTA-3300	
R63	82KΩ	1		BTA-82K	
R64	39KΩ	½		BTS-39K	
R65	5600Ω	½		BTS-5600	
R66	39KΩ	½		BTS-39K	
R67	4.7Meg	½		BTS-4.7Meg	
R68	3300Ω	1		BTA-3300	
R69	180KΩ	1		BTA-180K	
R70	220KΩ 5%	½		BTS-220K 5%	
R71	220KΩ	½		BTS-220K	
R72	220KΩ	½		BTS-220K	
R73	4700Ω 5%	½		BTS-4700 5%	
R74	100KΩ 5%	½		BTS-100K 5%	
R75	3300Ω	1		BTA-3300	
R76	220KΩ	1		BTA-220K	
R77	330KΩ	1		BTA-330K	
R78	1Meg	1		BTA-1Meg	
R79	470Ω	½		BTS-470	
R80	10KΩ	½		BTS-10K	
R81	82KΩ	½		BTS-82K	
R82	470Ω	½		BTS-470	
R83	10KΩ	½		BTS-10K	
R84	3Ω	1			
R85	100KΩ	½		BTS-100K	
R86	27KΩ 5%	½		BTS-27K 5%	
R87	270KΩ	½		BTS-270K	

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: PILOT PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.
T1	117VAC ⓐ. 55A	360VCT . 068ADC	5VAC ⓐ 2A	6.3VCT ⓐ. 88A SEC. 4 6.3VAC ⓐ2.61A	55-43					

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: PILOT PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	FM Ant. Coil	0Ω	0Ω	70-80				
L2	Cathode Choke	1Ω		75-33	19-1004		4529	5 Microhenries
L3	RF Choke	1Ω		75-33	19-1004		4529	5 Microhenries
L4	FM RF Coil	0Ω		71-40				
L5	Fil. Choke	0Ω		75-19	19-1001		4604	1.6 Microhenries
L6	Cathode Choke	1Ω		75-33	19-1004		4529	5 Microhenries
L7	FM Osc. Coil	0Ω		72-76				
L8	AM Ant. Coil	0Ω	0Ω	270-53				
L9	AM RF Coil	6Ω		71-41				Tapped at 1.9Ω
L10	Fil. Choke	0Ω		75-19	19-1001		4604	1.6 Microhenries
L11	RF Choke	1Ω		75-33	19-1004		4529	5 Microhenries
L12	AM Osc. Coil	2.4Ω		72-75	14-1003*	BC-387	71-Osc.■	Tapped at .4Ω
L13	1st FM IF	.7Ω	.7Ω	273-151	16-3487	FM-253	1463	
L14	1st AM IF	5.5Ω	5.5Ω	273-152				Tertiary winding = .4Ω
L15	2nd FM IF	.7Ω	.7Ω	273-151	16-3487	FM-253	1463	
L16	2nd AM IF	5.5Ω	5.5Ω	273-152				Tertiary winding = .4Ω
L17	3rd FM IF	.7Ω	.7Ω	273-151	16-3487	FM-253	1463	
L18	3rd AM IF	8.5Ω	8.5Ω	273-129	16-6758	BC-353	12-C2	
L19	4th FM IF	.7Ω	.7Ω	273-151	16-3487	FM-253	1463	
L20	Discriminator	.4Ω	1.5Ω	279-77				
L21	455KC Wave Trap	24Ω		79-102				
L22	Line Choke	0Ω		75-19	19-1001		4604	1.6 Microhenries
L23	Line Choke	0Ω		75-19	19-1001		4604	1.6 Microhenries
L24	10KC Filter	320Ω		79-106				Tapped at 148Ω

* Drill mounting hole.
■ Use primary winding only and drill mounting hole.

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA PILOT PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C48	.033	400				PT4133	IMP6-S3	3306133	
C49	.1	200		DF-104		PT401	IMP2-P1	330201	
C50	50			D6-500	GP1K-500	UC-545	K-1450		
C51	.047	400		DF-503		PT4147	IMP4-S47	3304147	
C52	.022	400		DF-203	817-02	PT4122	IMP2-S22	3302122	
C53	.022	400		DF-203	817-02	PT4122	IMP2-S22	3302122	
C54	.0051	400		D6-502	GP2-333-502	PT625	IMP6-D5	330425	
C55	.033	400				PT4133	IMP6-S3	3306133	
C56	800			DD-801	831-801				
C57	.047	400		DF-503		PT4147	IMP4-S47	3304147	
C58	250			D6-251	GP2K-251	UC-5325	IMP6-S22		
C59	.022	400		DF-203	817-02	PT4122	IMP4-S22	3304122	
C60	.01	400		D6-103	811-01	PT411	IMP4-S1	330411	
C61	.047	400		DF-503		PT4147	IMP4-S47	3304147	
C62	50			D6-500	GP1K-500	UC-545		K-1450	
C63	1000			D6-102	GP2L-102	UC-521			
C64	1200			D6-122	GP2L-122	UC-5212			
C65	.047	400		DF-503		PT4147	IMP4-S47	3304147	
C66	2.2			TCZ-2R2	NP0A-2R2				
C67	.047	400		DF-503		PT4147	IMP4-S47	3304147	
C68	250			D6-251	GP2K-251	UC-5325			
C69	.01	400		D6-103	811-01	PT411	IMP4-S1	330411	
C70	.1	200		DF-104		PT401	IMP2-P1	330201	
C71	.005	600		D6-502	GP2-333-502	PT625	IMP6-D5	330625	Note 2
C72	30	1000							
C73	.01	600		DF-503	811-01	PT611	IMP6-S1	330611	
C74	10000			DD-103	811-01	DC-511			Note 3
C75	3-12				557-3				

Note 1. Some versions may use a .01MMF capacitor in this application.
Note 2. Some versions may use a .022MMF capacitor in this application.
Note 3. Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA PILOT PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	36-50					Tap @ 100KΩ & 380KΩ
B	500KΩ	½						Tap @ 225KΩ & 380KΩ Vol. &Sw.
C	1Meg	½						Tap @ 450KΩ & 600KΩ
R2A	5Meg	½	A39-37-A	Q11-141	A47-5Meg-S	B-87	U-87	AFC
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A
R3A	5Meg	½	B37-29					Bass - Panel
B	5Meg	½						Treble - Rear
R4A	100KΩ	½	39-32C	Q11-128	A47-100K-S	B-40	U-41	Phono Load
B	Shaft		Not Req.	Not Req.	AK-1	Not Req.	Not Req.	Attach to R4A
R5A	25KΩ	½	39-33	Q11-120	A47-25K-S	AB-26	U-29	Hum Balance
B	Shaft		Not Req.	Not Req.	RS-2	AK-9	Not Req.	Attach to R5A
R6A	10KΩ	½	A39-38	Q11-116	A47-10K-S	B-14	U-20	10KΩ Filter Adjustment
B	Shaft		Not Req.	Not Req.	KS8-3	Not Req.	Not Req.	Attach to R6A

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA PILOT PART No.	IRC PART No.	NOTES
R7	270KΩ	½		BTS-270K	
R8	12KΩ	½		BTS-12K	
R9	470Ω	½		BTS-470	
R10	1Meg	½		BTS-1Meg	
R11	12KΩ	½		BTS-12K	
R12	1000Ω	½		BTS-1000	
R13	6800Ω	½		BTS-6800	
R14	22KΩ	½		BTS-22K	
R15	10KΩ	1		BTA-10K	
R16	470KΩ	½		BTS-470K	
R17	68Ω	½		BTS-68	
R18	270Ω	½		BTS-270	
R19	27KΩ	1		BTA-27K	
R20	3000Ω 5%	½		BTS-3000 5%	
R21	1Meg	½		BTS-1Meg	
R22	4300Ω 5%	½		BTS-4300 5%	
R23	430KΩ 5%	½		BTS-430K 5%	
R24	2.2Meg 5%	½		BTS-2.2Meg 5%	
R25	2.2Meg 5%	½		BTS-2.2Meg 5%	
R26	270KΩ	½		BTS-270K	
R27	68Ω	½		BTS-68	
R28	12KΩ	½		BTS-12K	
R29	1000Ω	½		BTS-1000	
R30	1Meg	½		BTS-1Meg	
R31	68Ω	½		BTS-68	
R32	12KΩ	½		BTS-12K	
R33	1000Ω	½		BTS-1000	
R34	39KΩ	½		BTS-39K	

PARTS LIST AND DESCRIPTIONS (Continued)

FILTER CHOKE

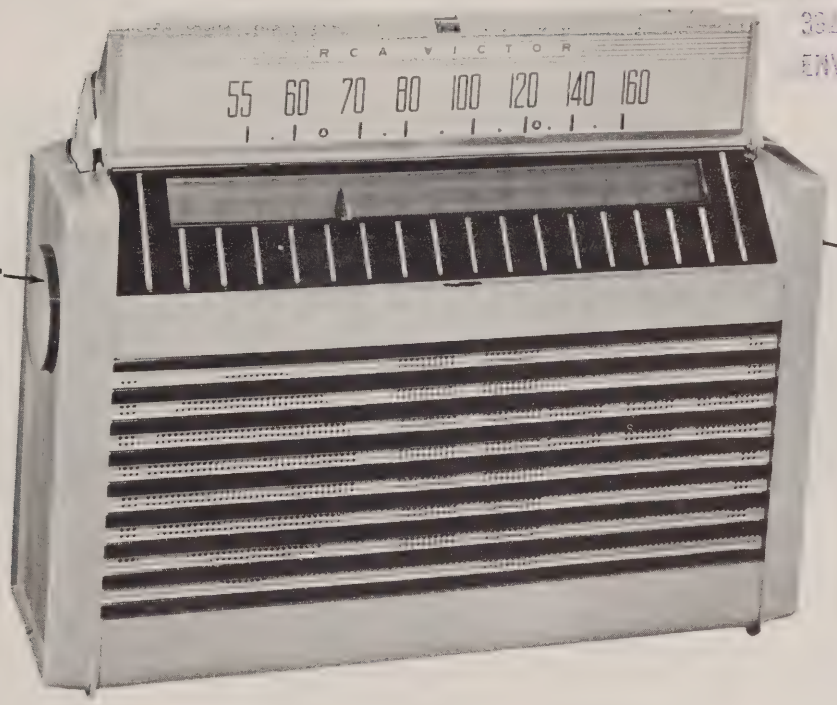
ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA PILOT PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.
L25	.068A	125Ω	4HY	57-16		C-2977 ①			

MISCELLANEOUS

ITEM No.	PART NAME	PILOT PART No.	NOTES
M1	Dial Light	68-6	FM Tuning Scale; #47, Bayonet
M2	Dial Light	68-6	FM Tuning Scale; #47, Bayonet
M3	Dial Light	68-6	AM Tuning Scale; #47, Bayonet
M4	Dial Light	68-6	AM Tuning Scale; #47, Bayonet
M5	Dial Light	68-6	Phono Position Indicator - #47, Bayonet
M6	Dial Light	68-6	Tape Position Indicator - #47, Bayonet
M7	Dial Light	68-6	Aux. Position Indicator - #47, Bayonet
M8	Tuning Cap.	191423	6 Gang - AM Sections (34-500MMF; 34-500MMF; 23-195MMF)
M9A	Switch	100-96	Selector - Rotary (Wafer Type)
B	Switch		Selector - Slidetype (3P-3Position) Mechanically ganged to M9A
M10A	Switch	100-97	Bass Equalizer (Rotary - Wafer Type)
B	Switch		Treble Equalizer (Rotary - Wafer Type)
M11	Switch	101-29	Phono Level (SPDT - Slidetype)
M12	Meter	110-490	Tuning Indicator

PROPERTY OF
FRANKENSHIP
DENVER, COLORADO

PROPERTY OF
F. BLACKSHIP
3624 [illegible] ST.
DENVER, COLORADO



RCA VICTOR MODEL
5-BX-41 (Ch. RS-1147)

TRADE NAME	RCA Victor Model 5-BX-41 (Ch. RS-1147)
MANUFACTURER	RCA Victor Radio & "Victrola" Div., Radio Corp. of America, Camden, N. J.
TYPE SET	Three Power Portable AM Superheterodyne Receiver
TUBES (Four)	Types 1R5 Conv., 1U4 IF Amp., 1U5 Det-AVC-AF Amp., 3V4 Output
POWER SUPPLY RATINGS	110-120 Volts AC-DC (or) 1.5 Volts "A" Supply & 67.5 Volts "B" Supply .12 Amp. @ 117 Volts AC (or) 240MA @ 1.5 Volts DC & 7.5MA @ 67.5 Volts DC
TUNING RANGE—BROADCAST	540KC - 1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use battery power if possible. If AC power is used, use an isolation transformer when available. If not, connect a .1MFD capacitor in series with low side of the signal generator and B-.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.005MFD	High side to antenna terminal lug. Low side to chassis.	455KC (400~ Mod)	Point of non-interference.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If AC power is used without an isolation transformer, reduce dummy antenna to 200MMF to reduce hum modulation.
2.		Loop	1620KC	Tuning gang fully open.	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	Tune to 1400KC signal.	"	A6	"
4.		"	600KC	Tune to 600KC signal.	"	A7	Adjust for maximum output while rocking tuning gang.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: RCA Victor PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	Converter	1R5	1R5	7AT	
V2	IF Amp.	1U4	1U4	6AR	
V3	Det-AVC-AF Amp.	1U5	1U5	6BW	
V4	Audio Output	3V4	3V4	6BX	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: RCA Victor PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.
C1A	50	150	79752				TM-3126	D-065
B	40	150						FMD-1508
C	10	150						
C2	100	25	79751			TC2501	TD-100-25	MTH-2510
C3	.047	400	77422	DF-503		PT4147	IMP2-S47	3304147
C4	56		75784	D6-560	GP1K-560	UC-5456		K-1456
C5	5		75613	TCN-5	N750A-050	NT-555		
C6	10000		73960	DD-103	811-01	DC-521		
C7	.003	200	73961					
C8	3		57090		NP0A-030	ZT-553		
C9	.22	200	79740			PT4022	IMP2-P22	3302022
C10	120		78142	D6-121	GP2K-121	UC-5312		K-1312
C11A	68		♦79767					
B	5000							
C	1000							
D	68							
E	2500							
C12	.0022	200	77942	D6-222	811-0022	PT6222	IMP6-D22	330622
C13	.047	400	75071	DF-503		PT4147	IMP4-S47	3304147
C14	.1	400	77423	DF-104		PT401	IMP4-P1	330401

♦ Items C11A, C11B, C11C, C11D, C11E, R9A, R9B, R9C and R9D are combined in one unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: RCA Victor PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	74285	Q13-137	A47-1Meg-Z	B-70-S	U-53	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-2	SWE-20	Not Req.	US-27	Attach to R1A

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: RCA Victor PART No.	IRC PART No.	NOTES
R2	100KΩ	½	502410	BTS-100K	
R3	15KΩ	½	502315	BTS-15K	
R4	1000Ω	½	502210	BTS-1000	
R5	470Ω	½	502147	BTS-470	
R6	4.7Meg	½	502547	BTS-4.7Meg	
R7	47KΩ	½	502347	BTS-47K	
R8	3.3Meg	½	502533	BTS-3.3Meg	
R9A	10Meg	½	♦79767	BTS-10Meg	
B	4.7Meg	½		BTS-4.7Meg	
C	1Meg	½		BTS-1Meg	
D	3.3Meg	½		BTS-3.3Meg	

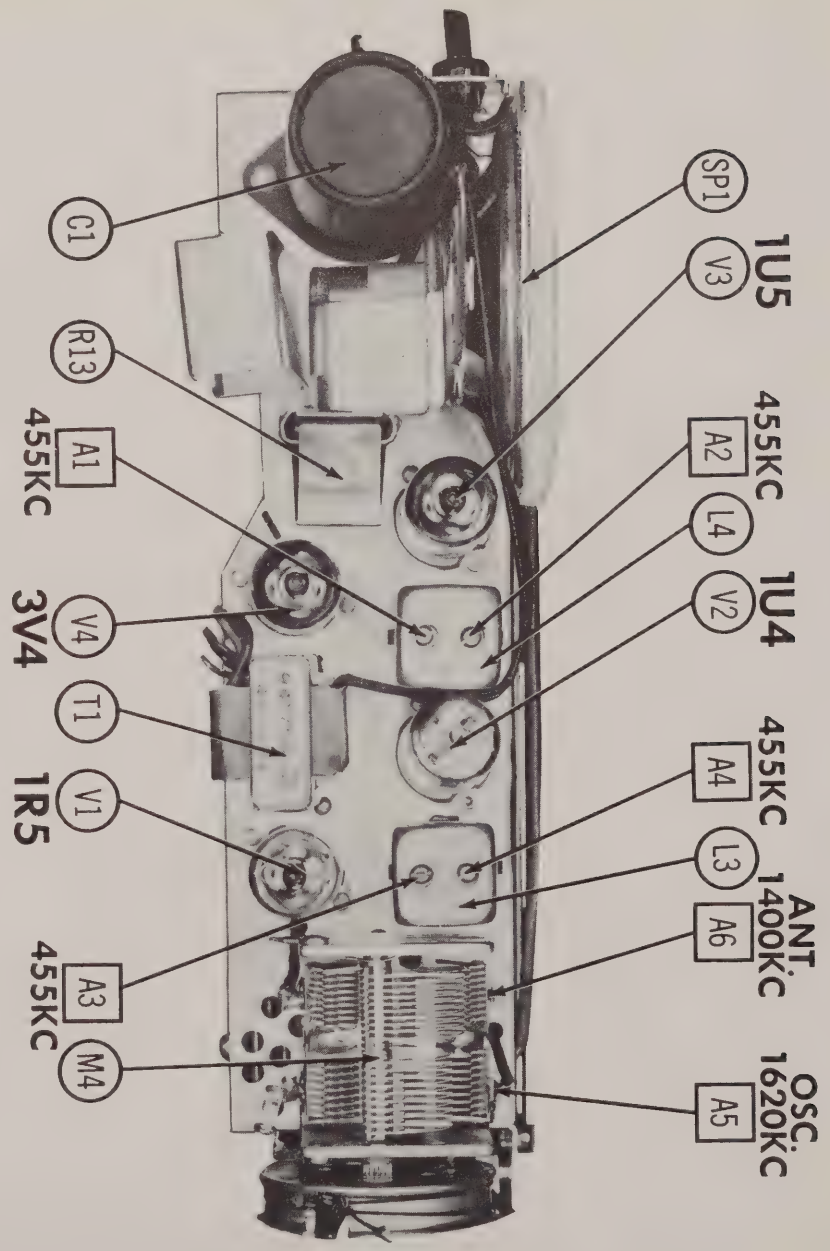
ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: RCA Victor PART No.	IRC PART No.	NOTES
R10	820Ω	½	502182	BTS-820	
R11	2200Ω	½	502222	BTS-2200	
R12	2200Ω	½	502222	BTS-2200	
R13A	1000Ω	7	79753		
B	1050Ω				
R14	15KΩ	½	502315	BTS-15K	
R15	100Ω	2	522110		
R16	22Ω	½	502022	BTS-22	
R17	390Ω	½	502139	BTS-390	
R18	1Meg	½	502510	BTS-1Meg	

♦ Items R9A, R9B, R9C, R9D, C11A, C11B, C11C, C11D and C11E are combined in one unit.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: RCA Victor PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	NOTES
T1	9.7KΩ	12.4Ω	75777						

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	RCA Victor PART No.	JENSEN PART No.	QUAM PART No.	
SP1	3"	PM	12. 4Ω	79765			

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	RCA Victor PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	. 6Ω		79768				
L2	Osc. Coil	1. 2Ω	6. 3Ω	79766	14-1040	BC-387*	71-Osc.	
L3	Input IF	30Ω	30Ω	79763	16-6758	BC-352	12-C1	
L4	Output IF	20Ω	20Ω	79764	16-6758	BC-353	12-C2	

* Do not use tapped terminal.

SELENIUM RECTIFIER

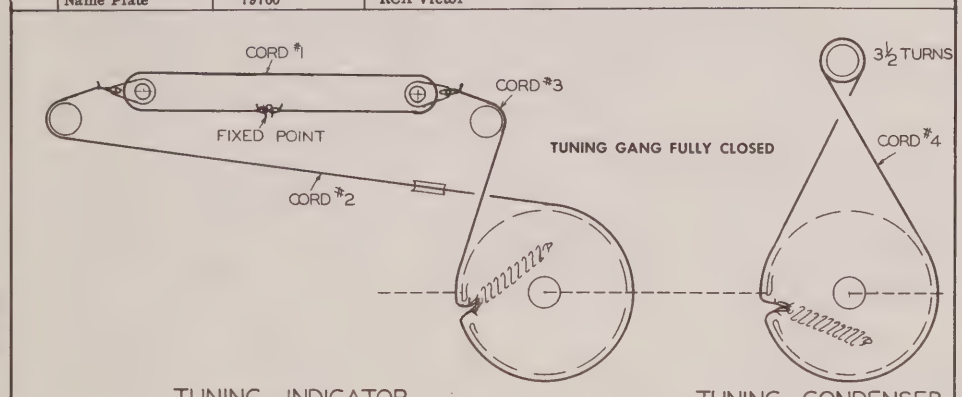
ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	RCA Victor PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	. 064A	77958	1230A	RS75	6S75	5M4	75	

BATTERIES

ITEM No.	VOLTAGE	RCA Victor PART No.	REPLACEMENT DATA						INSTALLATION NOTES
			EVEREADY			BURGESS			
			"A"	"B"	"A-B"	"A"	"B"	"A-B"	
M2	L 5V "A"	VS036	950			2R			Connect 2 in parallel
M3	67. 5V "B"	VS216		477			P45		

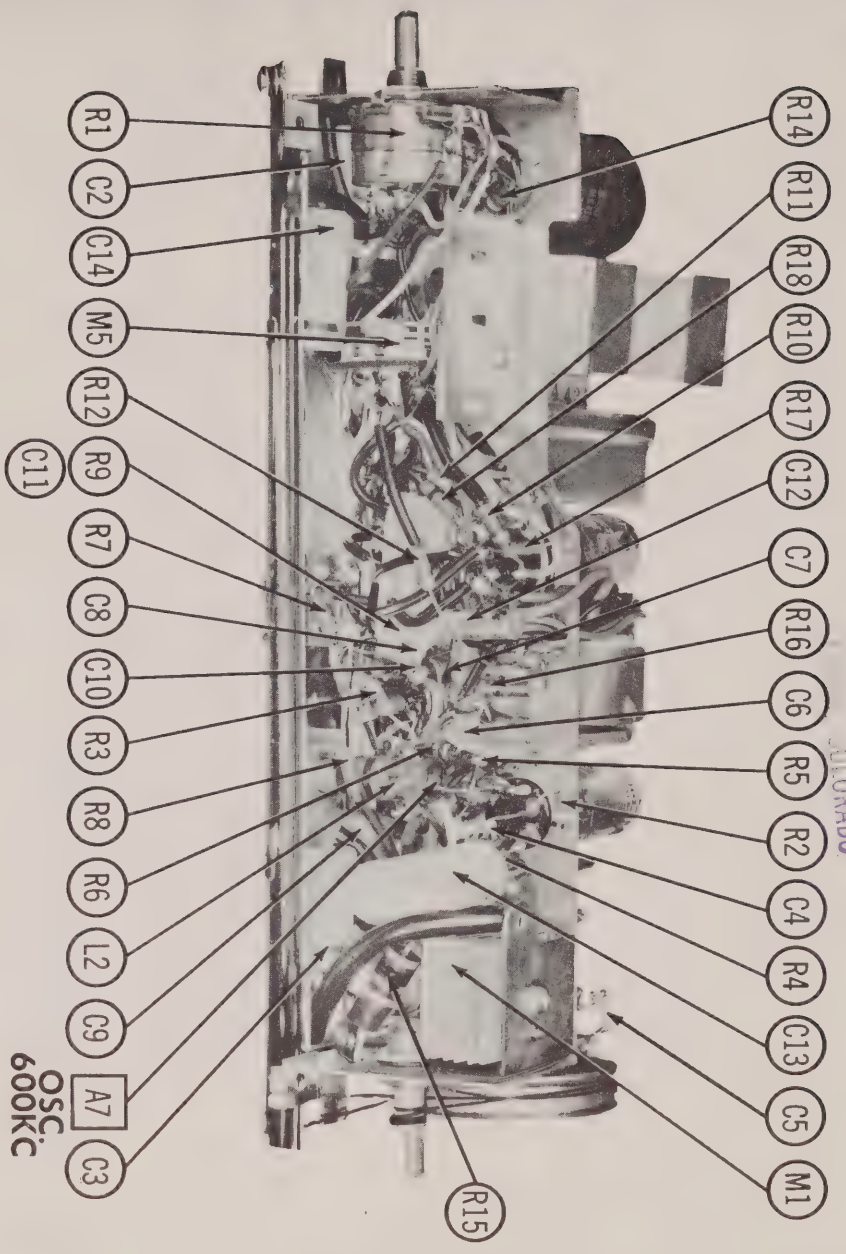
MISCELLANEOUS

ITEM No.	PART NAME	RCA Victor PART No.	NOTES
M4	Tuning Cap.	79769	2 Gang (15-260MMF; 15-130MMF)
M5	Switch	79754	Power Changeover
	Case	79806	Front Assembly
	Back	79742	Case
	Handle	79771	Carrying
	Lid	79762	Case
	Knob	79750	On-Off-Volume & Tuning
	Dial	79770	Station Selector
	Name Plate	79760	"RCA Victor"



DIAL CORD STRINGING

CHASSIS—BOTTOM VIEW



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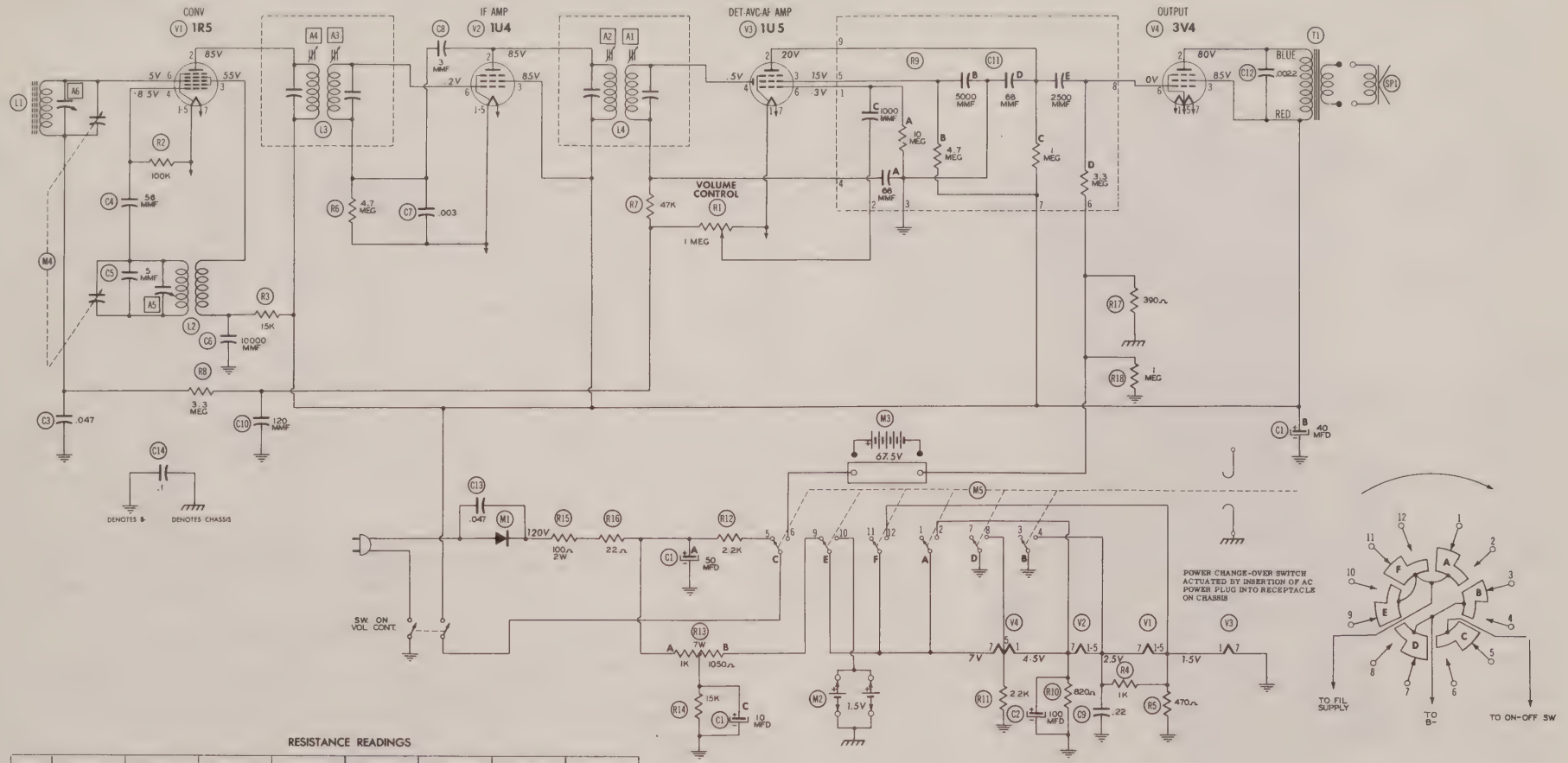

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	1R5	*	†2. 4KΩ	†17. 1KΩ	100KΩ	*	4. 3Meg	*
V 2	1U4	*	†2. 4KΩ	†24. KΩ	NC	*	4. 3Meg	*
V 3	1U5	*	†1Meg	†4. 7Meg	1. 4Meg	NC	10Meg	*
V 4	3V4	*	†2. 4KΩ	†2. 1KΩ	TP	*	4. 3Meg	*

* DO NOT USE OHMETER TO MEASURE FILAMENT RESISTANCE.
† MEASURED FROM OUTPUT OF M1.
TP - TIE POINT
NC - NO CONNECTION

IF = 455 KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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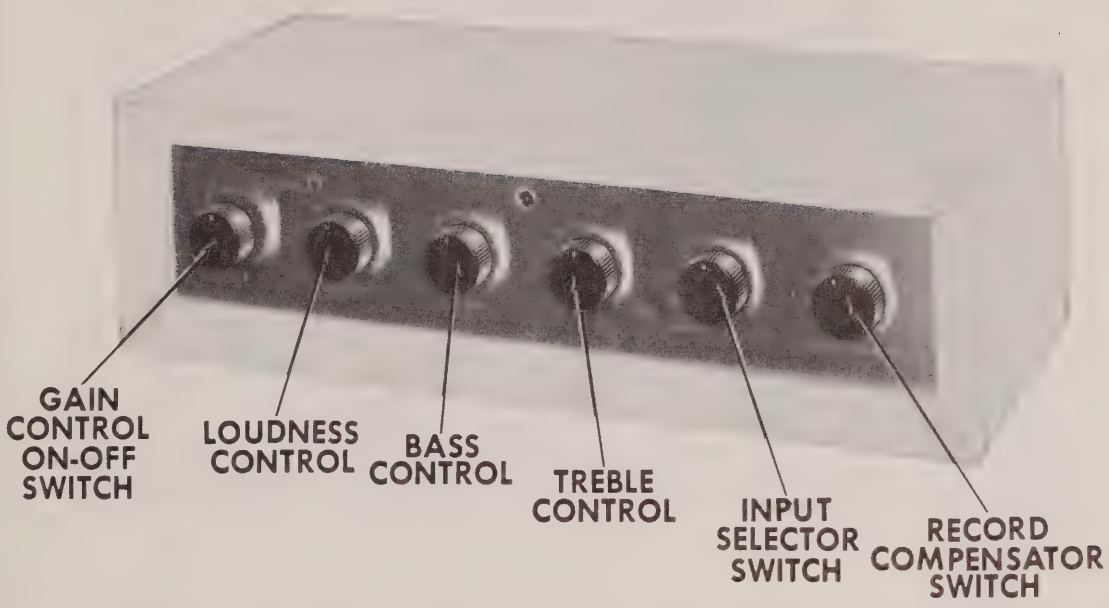

REGENCY
MODEL HF-350P

TRADE NAME	Regency Model HF-350P
MANUFACTURER	Regency Div., I.D.E.A., Inc., 7900 Pendleton Pike, Indianapolis, 26, Ind.
TYPE SET	AC Operated 7 Channel Equalizer - Preamplifier
TUBES (Five)	Types 12AX7 Preamp., 12AX7 AF Amp., 12AX7 Cath. Follower, 12AX7 AF Amp.-Cath. Follower, 6X4 Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING .21 Amp. @ 117 Volts AC

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		REGENCY PART No.	STANDARD REPLACEMENT		
V1	Preamplifier	12AX7	12AX7	9A	
V2	AF Amplifier	12AX7	12AX7	9A	
V3	Cathode Follower	12AX7	12AX7	9A	
V4	AF Amplifier-Cathode Follower	12AX7	12AX7	9A	
V5	Rectifier	6X4	6X4	5BS	

CAPACITORS

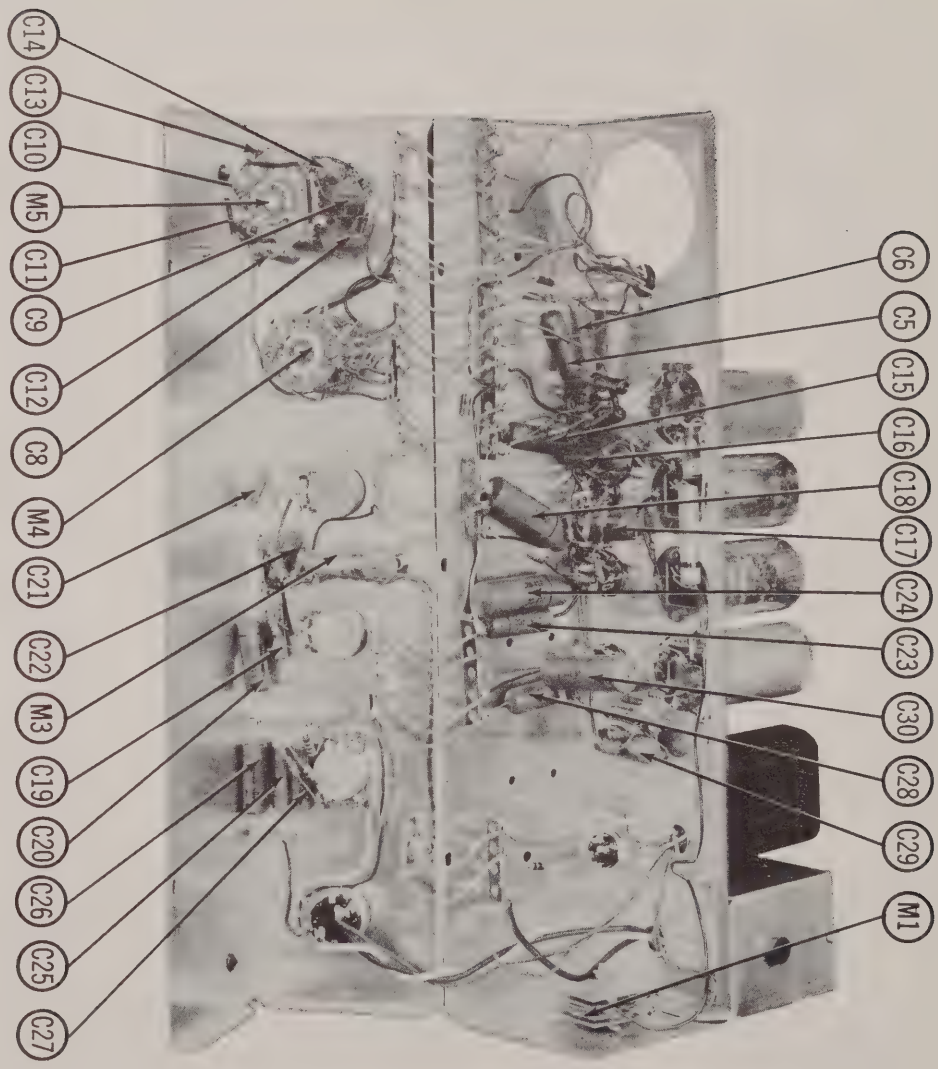
Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT	REGENCY PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	▲20	450	30-011-7			FP444	TM-Q20-450	Q-040	
B	■20	450							
C	▲20	450							
D	20	450							
C2A	▲20	450	30-011-7			FP444	TM-Q20-450	Q-040	
B	■20	450							
C	▲20	450							
D	20	450							
C3	2000	15	30-011-6			WP041	TM-2000-15	S-025	
C4	2000	15	30-011-6			WP041	TM-2000-15	S-025	
C5	.05	400		DF-503		PT415	IMP4-S5	330415	
C6	.01	400		D6-103		PT411	IMP4-S1	330411	
C7	.004	400		D6-403	GP2-333-402	PT624	IMP6-D4	330624	
C8	.02	400		DF-203		PT412	IMP4-S2	330412	
C9	.039	400				PT4139	IMP4-S39	3304139	
C10	.01	400		D6-103	GP2-333-103	PT411	IMP4-S1	330411	
C11	.015	400				PT4115	IMP4-S15	3304115	
C12	.027	400				PT4127	IMP4-S27	3304127	
C13	.001	400		D6-102	GP2L-102	PT421	IMP4-D1	330421	
C14	.001	400		D6-102	GP2L-102	PT421	IMP4-D1	330421	
C15	.05	400		DF-503		PT415	IMP4-S5	330415	
C16	.05	400		DF-503		PT415	IMP4-S5	330415	
C17	.05	400		DF-503		PT415	IMP4-S5	330415	
C18	.25	400				PT4025	IMP4-P25	3304025	
C19	.004	400		DD-402	GP2-333-402	PT424	IMP4-D4	330424	
C20	.04	400							
C21	300	500						CR-1330	
C22	.003	400		D6-302	GP2-333-302	PT423	IMP4-D3	330423	
C23	.05	400		DF-503		PT415	IMP4-S5	330415	
C24	.25	400				PT4025	IMP4-P25	3304025	
C25	.015	400				PT4015	IMP4-S15	3304115	
C26	.025	400				PT4125	IMP4-S15	3304125	
C27	.007	400		D6-702		PT427	IMP4-D7	330427	
C28	.05	400		DF-503		PT415	IMP4-S5	330415	
C29	.05	400		DF-503		PT415	IMP4-S5	330415	
C30	.25	400				PT4025	IMP4-P25	3304025	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	REGENCY PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	500KΩ	½	100-581-5	Q13-133	A47-500K-Z	B-60-S	U-48	Gain
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWE-12	Not Req.	US-26	Attach to R1A
R2	500KΩ	½	100-625					Loudness tapped @ 450KΩ and 380KΩ
R3A	500KΩ	½	100-581-4	Q13-133	A47-500K-Z	B-60	U-48	Bass
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R3A
R4A	500KΩ	½	100-581-4	Q13-133	A47-500K-Z	B-60	U-48	Treble
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R4A
R5	500KΩ	½	100-596-1					Magnetic phono level #1
R6	500KΩ	½	100-596-1					Magnetic phono level #2
R7	500KΩ	½	100-596-1					Input level #3
R8	500KΩ	½	100-596-1					Input level #4
R9	500KΩ	½	100-596-1					Input level #5
R10	500KΩ	½	100-596-1					Input level #6
R11	500KΩ	½	100-596-1					Microphone Input level #7

CHASSIS—BOTTOM VIEW



PROPERTY
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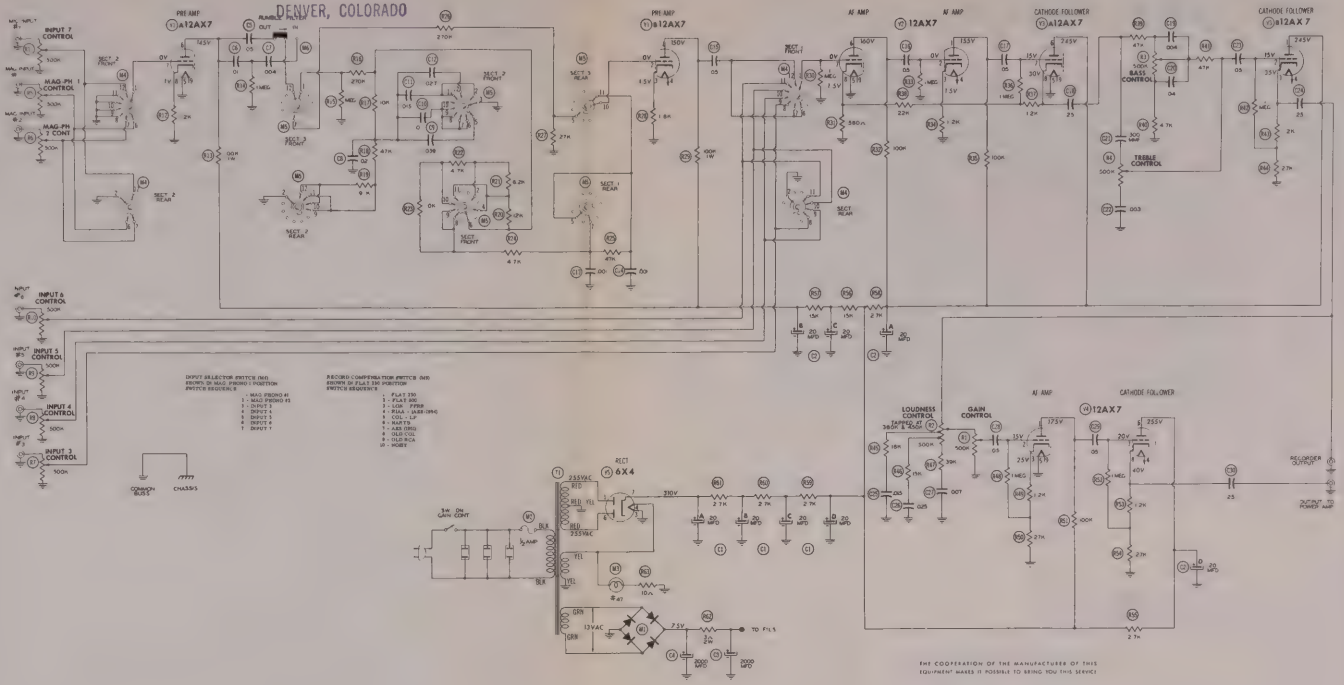
3324 MEADE ST
DENVER, COLORADO



INPUT SELECTOR SWITCH (S6)
SHOWN IN MAG PHONO 1 POSITION
SWITCH SEQUENCE
1 - MAG PHONO #1
2 - MAG PHONO #2
3 - INPUT 3
4 - INPUT 4
5 - INPUT 5
6 - INPUT 6
7 - INPUT 7

RECORD COMPENSATION SWITCH (S10)
SHOWN IN FLAT 330 POSITION
SWITCH SEQUENCE
1 - FLAT 330
2 - FLAT 500
3 - LOR FP88
4 - RIAA - LAB (RIAA)
5 - COL - LP
6 - AES (RIAA)
7 - AES (RIAA)
8 - OLD COL
9 - OLD RCA
10 - NORT

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AX7	†130KΩ	100KΩ	1.8KΩ	.1Ω	0Ω	†130KΩ	500KΩ	1.2KΩ	0Ω
V 2	12AX7	†110KΩ	1Meg	1.2KΩ	.1Ω	0Ω	†110KΩ	350KΩ	560Ω	0Ω
V 3	12AX7	†10.2KΩ	1Meg	28KΩ	.1Ω	0Ω	†10.2KΩ	1Meg	22KΩ	0Ω
V 4	12AX7	†110KΩ	1Meg	28KΩ	.1Ω	0Ω	†10.2KΩ	1Meg	28KΩ	0Ω
V 5	6X4	750Ω	NC	0Ω	.1Ω	NC	750Ω	90KΩ		

† MEASURED FROM PIN 7 OF V5

THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

1 - DC voltages measured with Vacuum Tube Voltmeter
AC voltages measured at 1/2 of rated line input
2 - Rated capacitor and resistor values
3 - Measurements are made with model set to maximum
4 - Line voltage maintained at 117 volts for readings
5 - Tolerance of ± 10% on voltage and resistance readings
6 - All controls in normal position, proper output load connected

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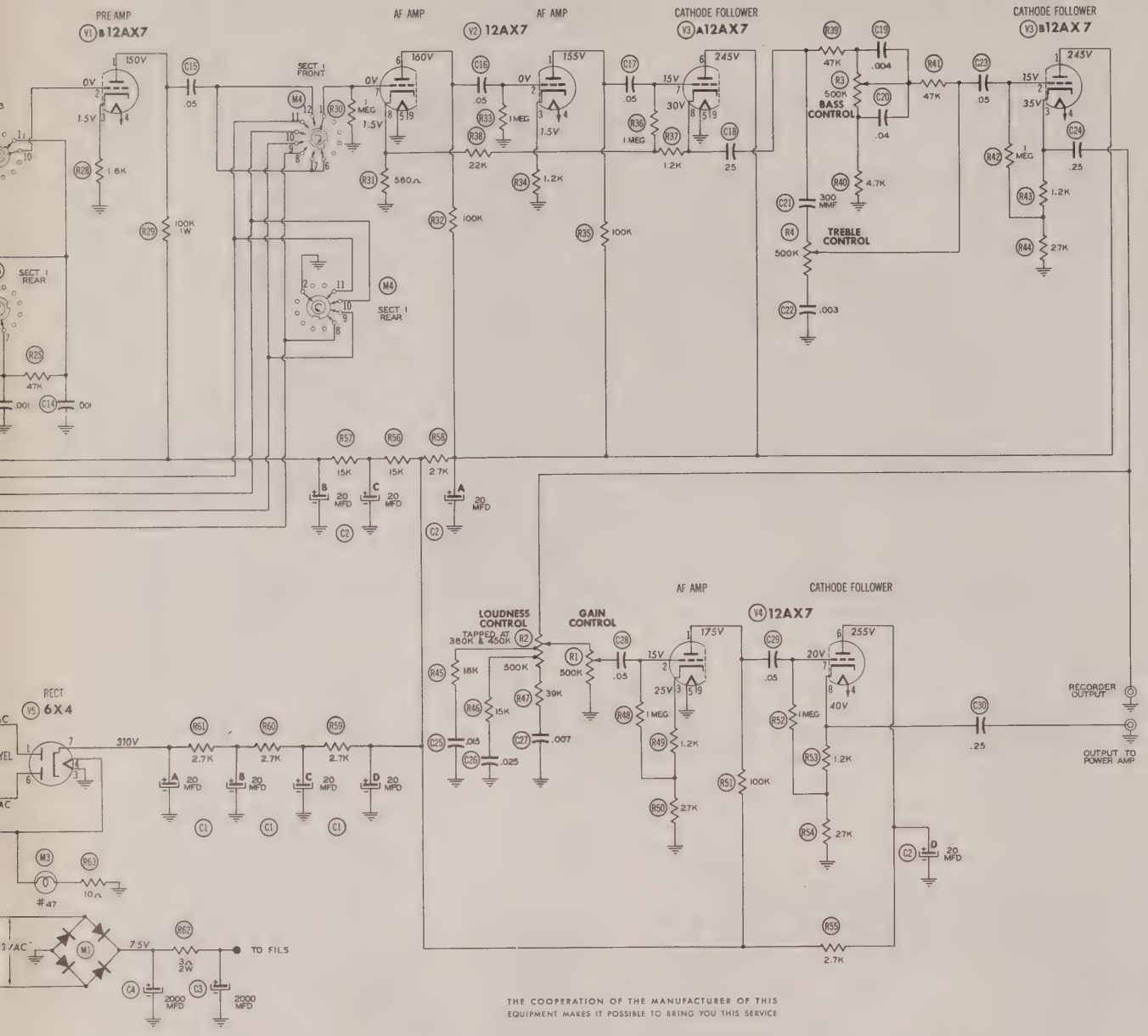
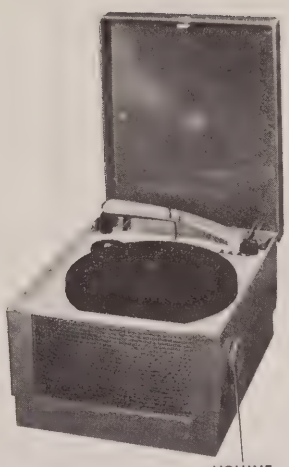


THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

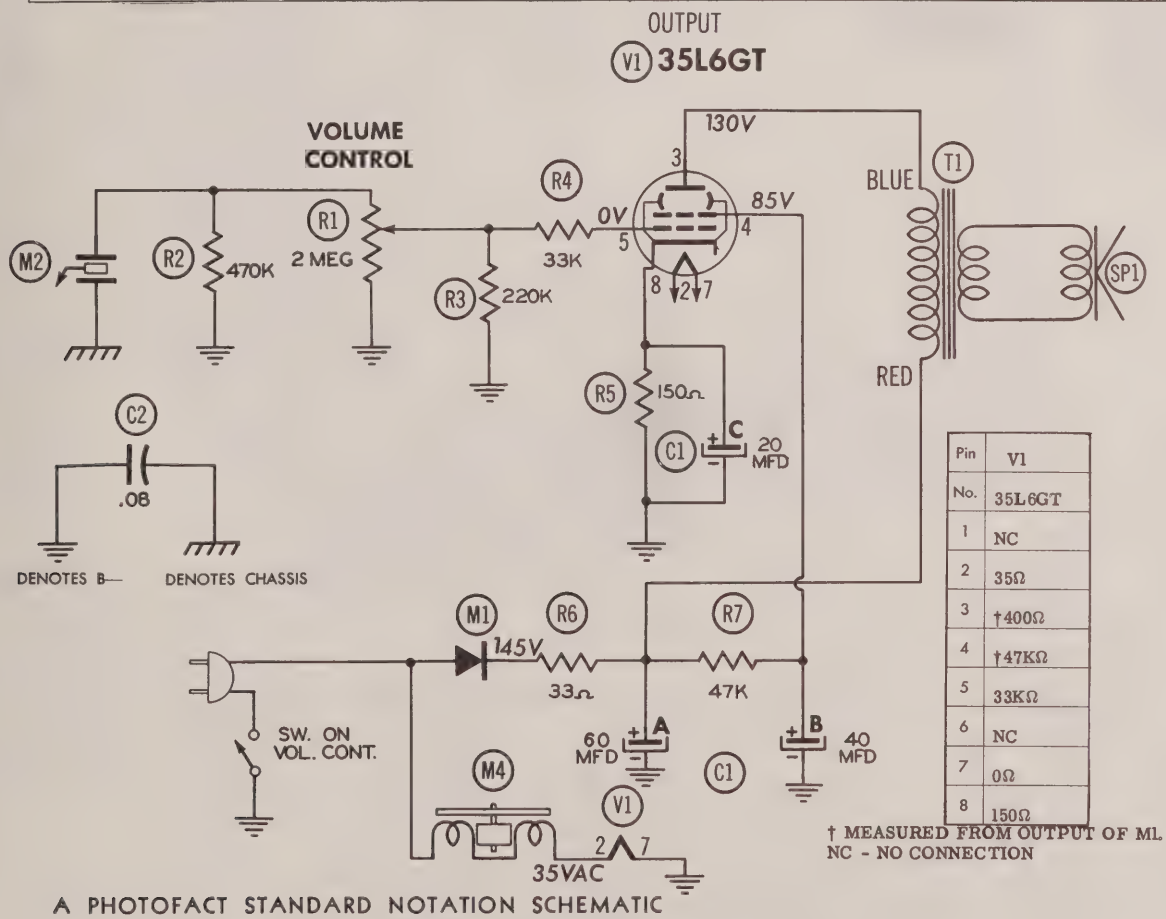
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

PROPY
L. F. BL
3924 M
DENVER, COLORADO

SILVERTONE MODEL
4243 (Ch. 488.22000)



TRADE NAME	Silvertone Model 4243 (Ch. 488. 22000)
SUPPLIER	Sears Roebuck & Co., 925 S. Homan, Chicago, Ill.
TYPE SET	AC Operated Phono Amplifier With 4 Speed Record Player
TUBES (One)	Type 35L6GT Audio Amplifier
POWER SUPPLY	105-120 Volts AC - 60 Cycles
RATING	.22 Amp. @ 117 Volts AC



Pin No.	V1 35L6GT
1	NC
2	35Ω
3	†400Ω
4	†47KΩ
5	33KΩ
6	NC
7	0Ω
8	150Ω

† MEASURED FROM OUTPUT OF M1.
NC - NO CONNECTION

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: SILVERTONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	AF Amp. - Audio Output	35L6GT	35L6GT	7S	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: SILVERTONE PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	60	150				FP311.1	TM-3015	T-310	
B	40	150							
C	20	25							
C2	.08	400						330618	

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: SILVERTONE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2Meg	½	11950	Q11-139	A47-2Meg-S	AB-75	U-56	Volume
B	Shaft		Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWE-12	KB-1	US-26	Attach to R1A

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: SILVERTONE PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R2	470KΩ	½		BTS-470K	
R3	220KΩ	½		BTS-220K	
R4	33KΩ	½		BTS-33K	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: SILVERTONE PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R5	150Ω	½		BTS-150	
R6	33Ω	½		BTS-33	
R7	47KΩ	½		BTS-47K	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: SILVERTONE PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	NOTES
T1	2.4KΩ	3.3Ω	Part of speaker	A-3876 ①	A-2928 ①	S-2X ①	Z1001 ①	24850 ①	① Bend mounting tabs down, file out slots and mount on original mounting bracket.

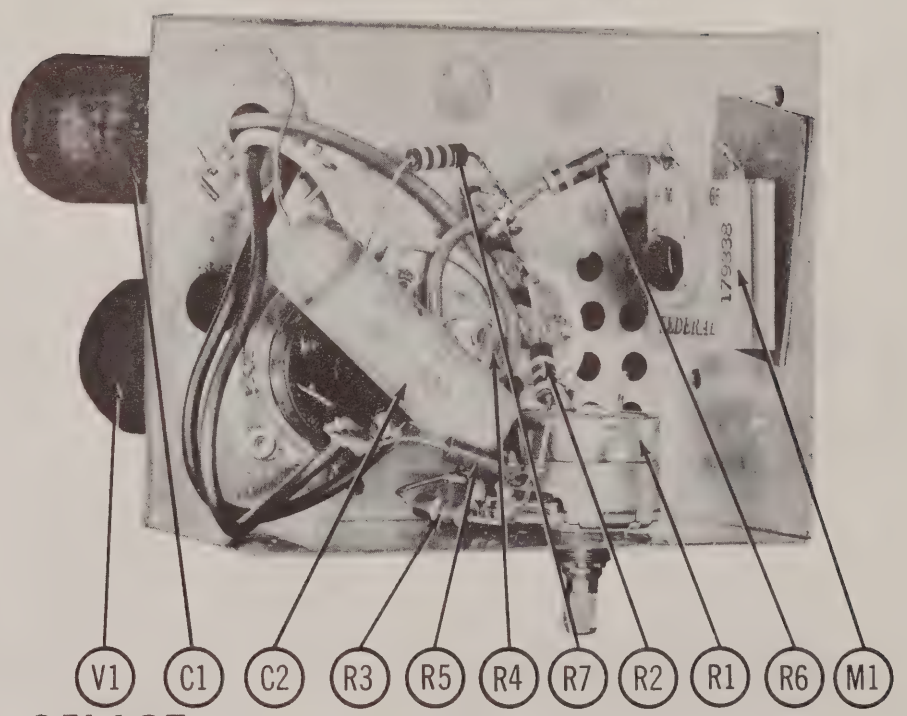
SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: SILVERTONE PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	4"	PM	3.3Ω	5748	ST-113 Mod. P4-X	4A07	

SELENIUM RECTIFIER

ITEM No.	RATING: CURRENT	REPLACEMENT DATA: SILVERTONE PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.035A		1263A	RS65	6S65	8J1	65	

CHASSIS—BOTTOM VIEW



35L6GT

PARTS LIST AND DESCRIPTIONS (Continued)

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: SILVERTONE PART No.	ASTATIC PART No.: CARTRIDGE	ASTATIC PART No.: NEEDLE	ELECTRO-VOICE PART No.: CARTRIDGE	ELECTRO-VOICE PART No.: NEEDLE	REMARKS
M2	K5745	16L3				

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA: SILVERTONE PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M3		*J-152	*B-379	*W-14AGA	* Metal

MISCELLANEOUS

ITEM No.	PART NAME	SILVERTONE PART No.	NOTES
M4	Phono Motor	5963	Alternate Part No. 6491
	Case	5706	
	Lid	7728-A8	
	Knob	5945-A10	On-Off-Volume
	Knob	4374-A13	Speed
	Pushbutton	5713	
	Name Plate	7737	

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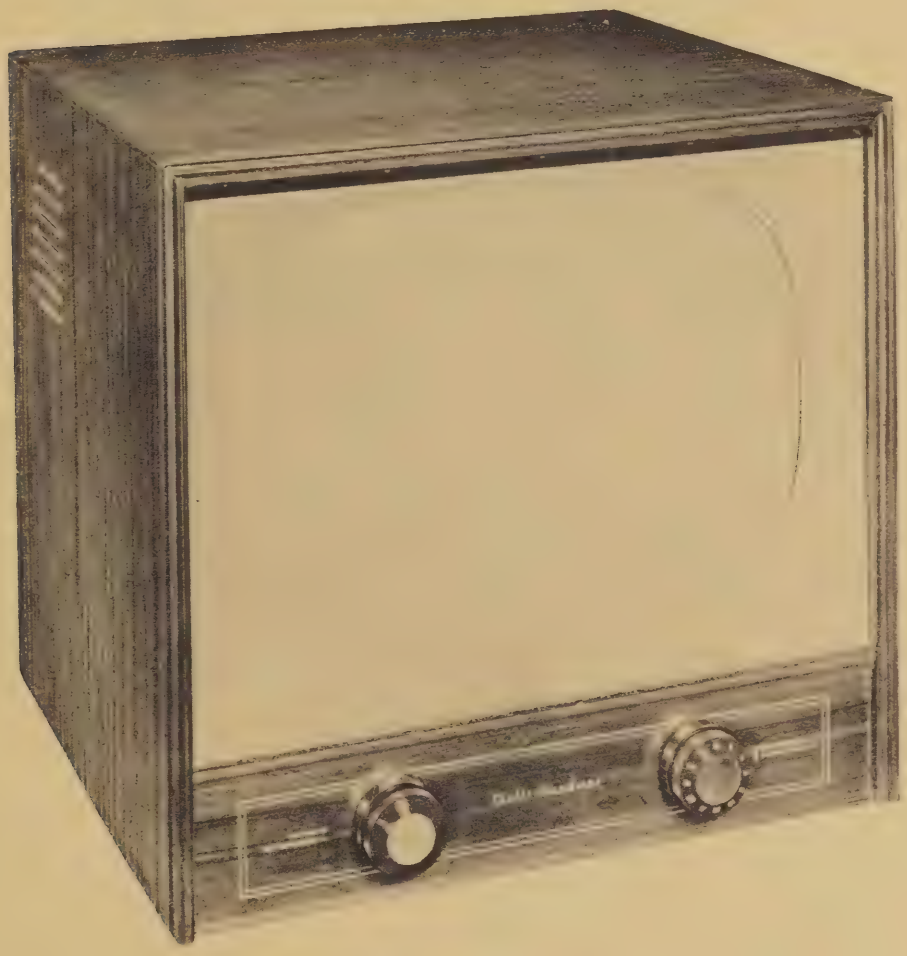

MODEL 321AM49-A-436

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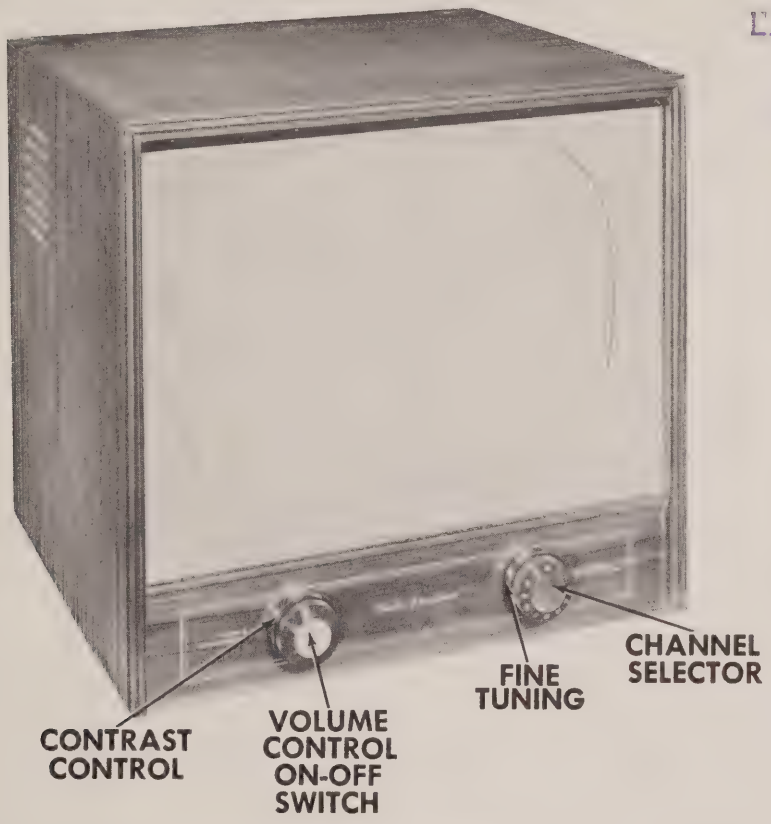
3924 MEADE
DENVER, COLORADO



WELLS-GARDNER MODELS 321AM49-A-436, 321AM49-A-470, 2321AM49-A-438, 2321AM49-A-494

WELLS-GARDNER MODEL 321AM49-A-436

TRADE NAME	Wells-Gardner	MODELS 321AM49-A-436, 321AM49-A-470, 2321AM49-A-438, 2321AM49-A-494
MANUFACTURER	Wells-Gardner Co., 2701 N. Kildare Ave., Chicago 39, Ill.	
TYPE SET	Television Receiver	
TUBES	Twenty	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING 1.4 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13, Video IF 26.2MC, Sound IF 21.1MC (Intercarrier)	

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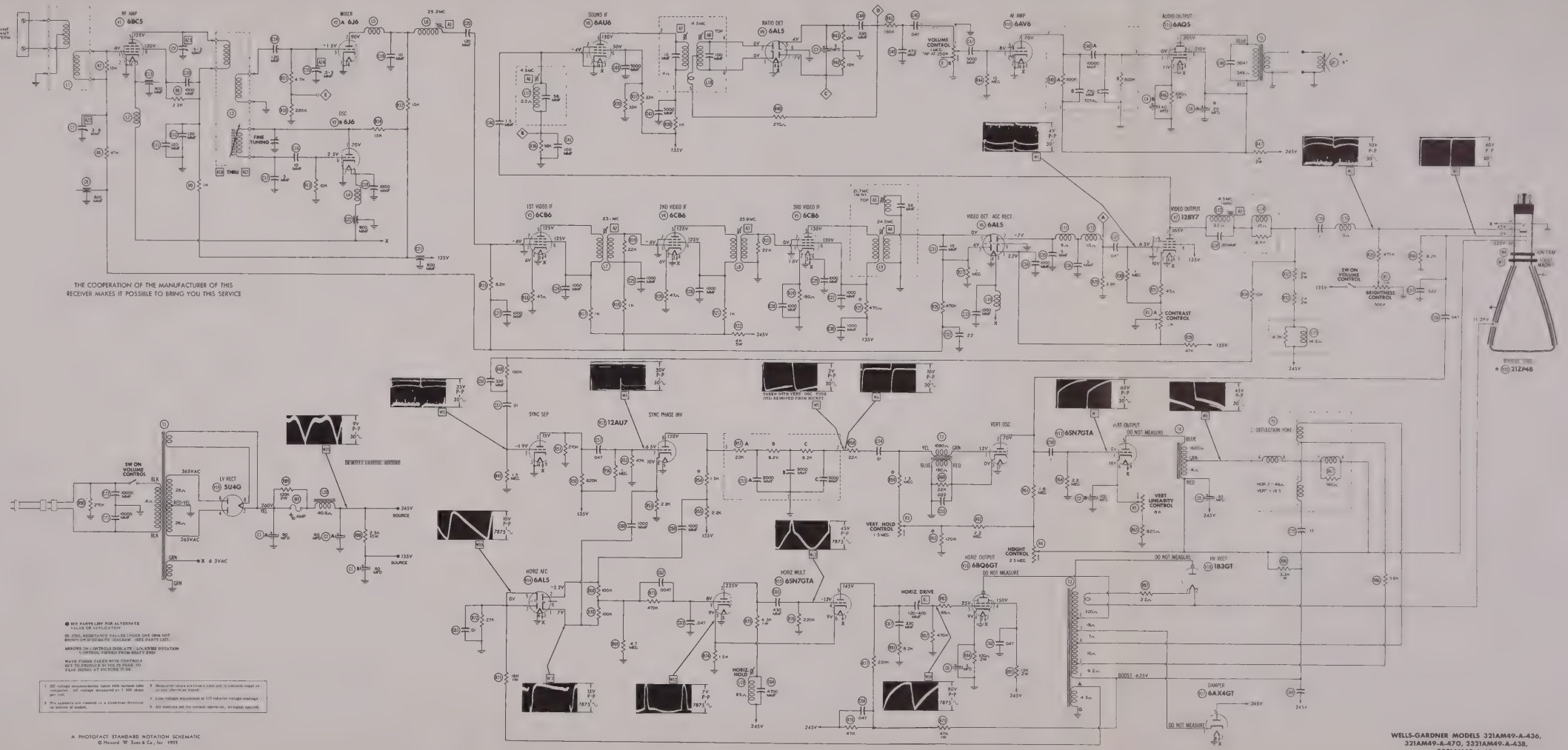

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM - SEE PARTS LIST.

ARROWS ON ↓ CONTROLS INDICATE ↓ CW-SYNC ROTATION ↓ CONTROL VIEWED FROM SHAFT END

WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 10 VOLTS PEAK TO PEAK SIGNAL AT PICTURE TUBE

1. DC voltage measurements taken with vacuum tube voltmeter. AC voltage measured on 1,000 ohms per volt.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from chassis pin to common negative (B-) unless otherwise noted.
4. Line voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation, no signal applied.

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WELLS-GARDNER MODELS 321AM49-A-436, 321AM49-A-470, 2321AM49-A-438, 2321AM49-A-494

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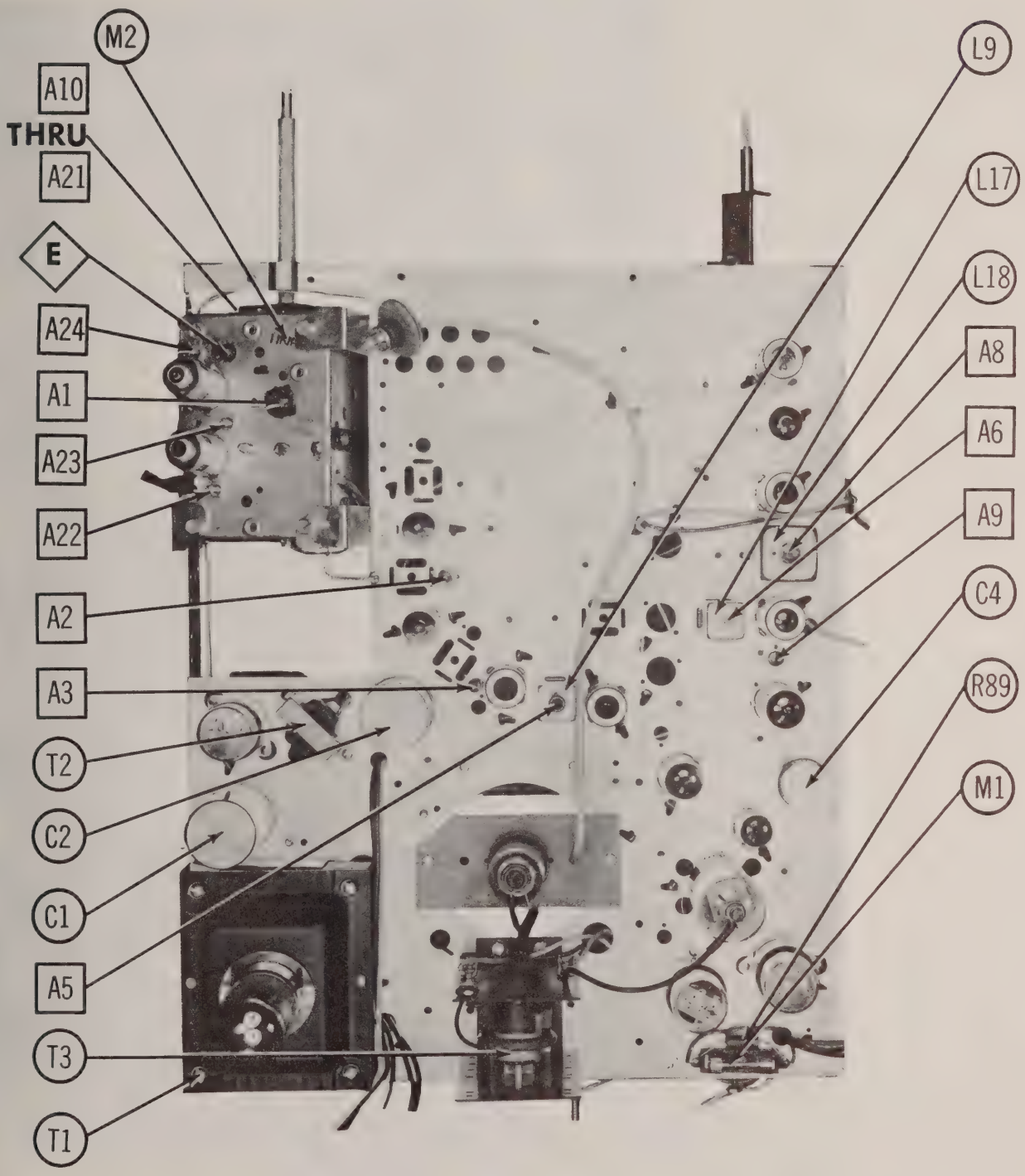
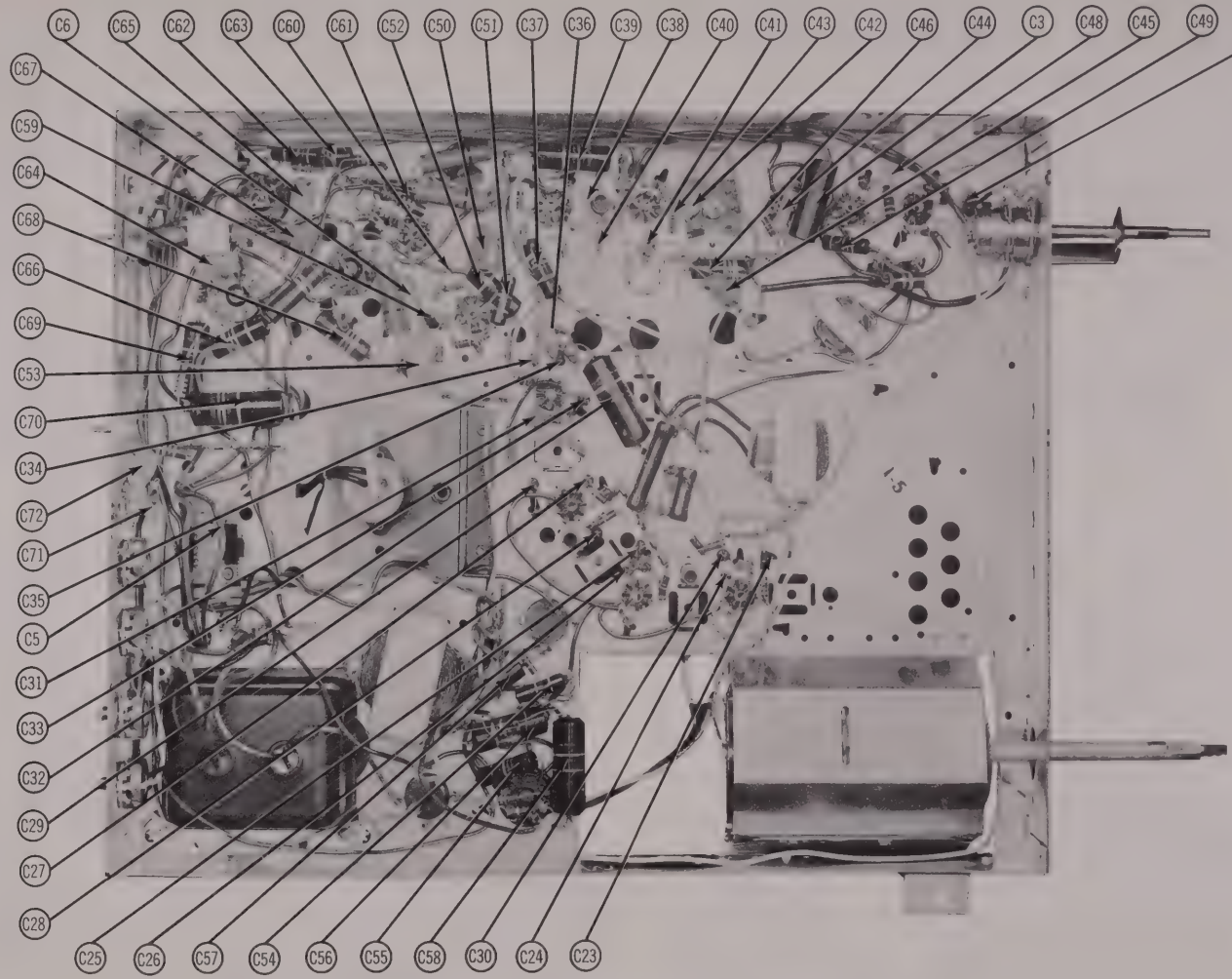
INSHIP
3324 MEADE ST.
DENVER, COLORADO



CHASSIS TOP VIEW

SET 278 FOLDER 13

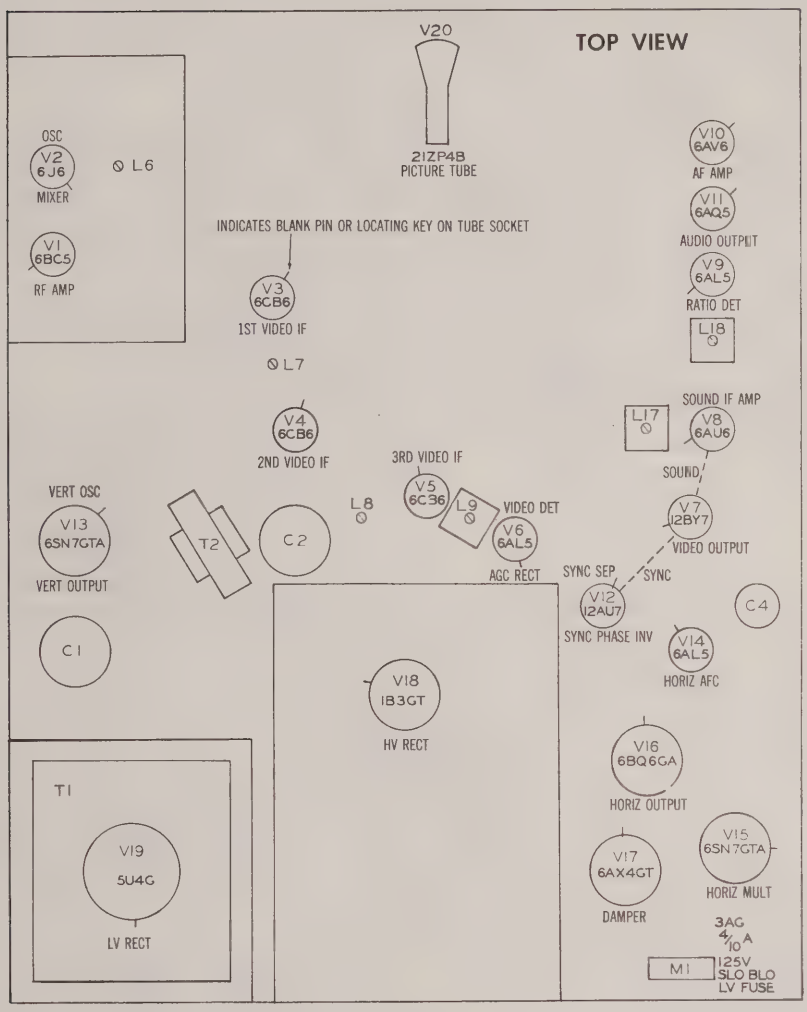


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

DENVER, COLORADO

L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V19, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V6, V7**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V7, V20**
Has pic, no sound - **V8, V9, V10, V11**

SYNC FAILURE
No vert. sync - **V12, V13**
No horiz. sync - **V12, V14, V15**
No vert. or horiz. sync - **V12**

SWEEP FAILURE
No raster, has sound - **V15, V16, V17, V18, V20**
No vertical deflection - **V13**
Poor vert. linearity or foldover - **V13**
Poor horiz. linearity or foldover - **V15, V16, V17**
Narrow picture - **V15, V16, V17, V18, V19**
Vert. off freq. - **V12, V13**
Horiz. off freq. - **V12, V14, V15**

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage shock hazard may be eliminated by removing the horizontal oscillator tube (V15).

VIDEO IF ALIGNMENT

Remove the converter tube (V2) and replace a 6J6 which has pin 1 removed. This will disable the local oscillator and reduce the possibility of erroneous indications.
Connect the negative lead of a 4.5 volt bias supply to the ungrounded side of C23. Positive lead to chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over dummy converter tube.	25.2MC (Unmod)	Any	DC probe thru decoupling filter (Fig.1) to point (A). Common to chassis.	A1	Adjust for maximum deflection. Attenuate signal generator output for less than 2 volts at point (A) on VTVM.
2.	"	"	23.1MC	"	"	A2	"
3.	"	"	25.9MC	"	"	A3	"
4.	"	"	24.0MC	"	"	A4	"
5.	"	"	21.7MC	"	"	A5	Adjust for MINIMUM deflection.

OVERALL VIDEO IF RESPONSE CHECK

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Direct	High side to an ungrounded tube shield floating over dummy converter tube.	24MC (10MC Swp)	21.7MC 23.0MC 23.5MC 25.25MC 26.2MC	Any	Vert. Amp. thru decoupling filter (Fig. 1) to point (A). Common to chassis.		Check for response curve similar to Fig. 2. If necessary SLIGHTLY retouch A1 thru A4. Amplitude of the video marker (26.2MC) is controlled by A1 and A3 adjustments. Adjust A4 for flatness of response curve and replacement of 23.5MC marker. Avoid adjusting A2 unless it is absolutely necessary due to the effect it has on sound rejection. A2 places the 23.0MC marker on response curve.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Remove V5 from its socket.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
7.	.01MFD	High side to point (A). Low side to chassis.	4.5MC (Unmod)	Any	DC probe to point (B). Common to chassis.	A6	Adjust for maximum deflection.
8.	"	"	"	"	DC probe to point (C). Common to chassis.	A7	"
9.	"	"	"	"	DC probe to point (D). Common to chassis.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Remove V5 from its socket.
Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	.01MFD	High side to point (A). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. thru decoupler (Fig.1) to point (C). Low side to chassis.	A6	Disconnect stabilizing capacitor C3. Adjust for curve of maximum amplitude and symmetry as in Fig. 3.
8.	"	"	"	"	"	"	A7	"
9.	"	"	"	"	"	Vert. Amp. thru decoupler (Fig.1) to point (D). Low side to chassis.	A8	Reconnect stabilizing capacitor C3. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 4. SLIGHTLY retouch A7 for maximum amplitude and straightness of crossover lines. Replace V5 in its socket.

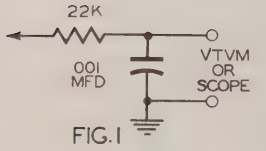


FIG.1

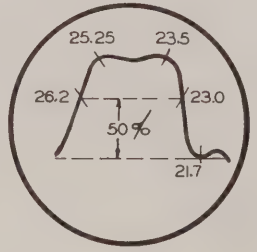


FIG.2

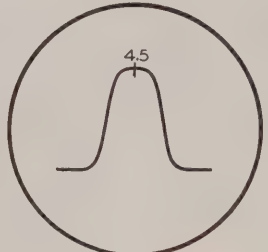


FIG. 3

ALIGNMENT INSTRUCTIONS (cont)

LAFAYETTE RADIO
DENVER, COLORADO

4.5MC TRAP ALIGNMENT

Turn contrast control to maximum clockwise position.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	10KΩ	High side thru 10KΩ to point (A). Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe to pin 11 (cathode of picture tube). Common to chassis.	A9	Adjust for MINIMUM deflection.

OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the original 6J6 in its socket.
Connect bias as under "Video IF Alignment".
The oscillator screws for each channel are reached thru a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible thru this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru decoupler (Fig. 1) to point (A). Low side to chassis.	A10	Adjust to place sound marker in notch as in Fig. 5. Video marker should be at 50%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A11	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A12	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A13	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A14	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A15	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A16	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A17	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A18	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A19	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A20	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A21	

RF AND MIXER ALIGNMENT

Connect the negative lead of a 3 volt bias supply to the ungrounded side of C23. Positive lead to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205.25MC 209.75MC	12	Vert. Amp. thru decoupler (Fig. 1) to point (E). Low side to chassis.	A22, A23, A24	Adjust for response similar to Fig. 6 with markers above 90%.
13.	"	"	213MC (10MC Swp)	211.25MC 215.75MC	13	"		Check for response similar to Fig. 6. If markers fall below 70% on any channel make slight compromise adjustment of A22, A23 and A24 with channel switch set to that channel. Recheck all other channels to see that they have not been seriously affected.
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			195MC (10MC Swp)	193.25MC 197.75MC	10			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
			85MC (10MC Swp)	83.25MC 87.75MC	6			
			79MC (10MC Swp)	77.25MC 81.75MC	5			
			69MC (10MC Swp)	67.25MC 71.75MC	4			
			63MC (10MC Swp)	61.25MC 65.75MC	3			
			57MC (10MC Swp)	55.25MC 59.75MC	2			

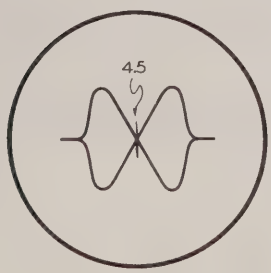


FIG. 4

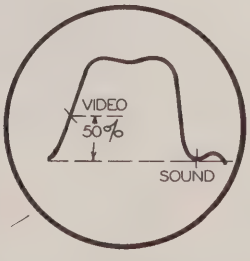


FIG. 5

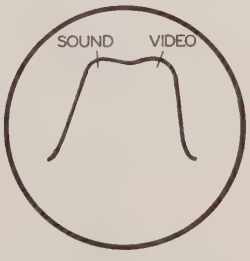
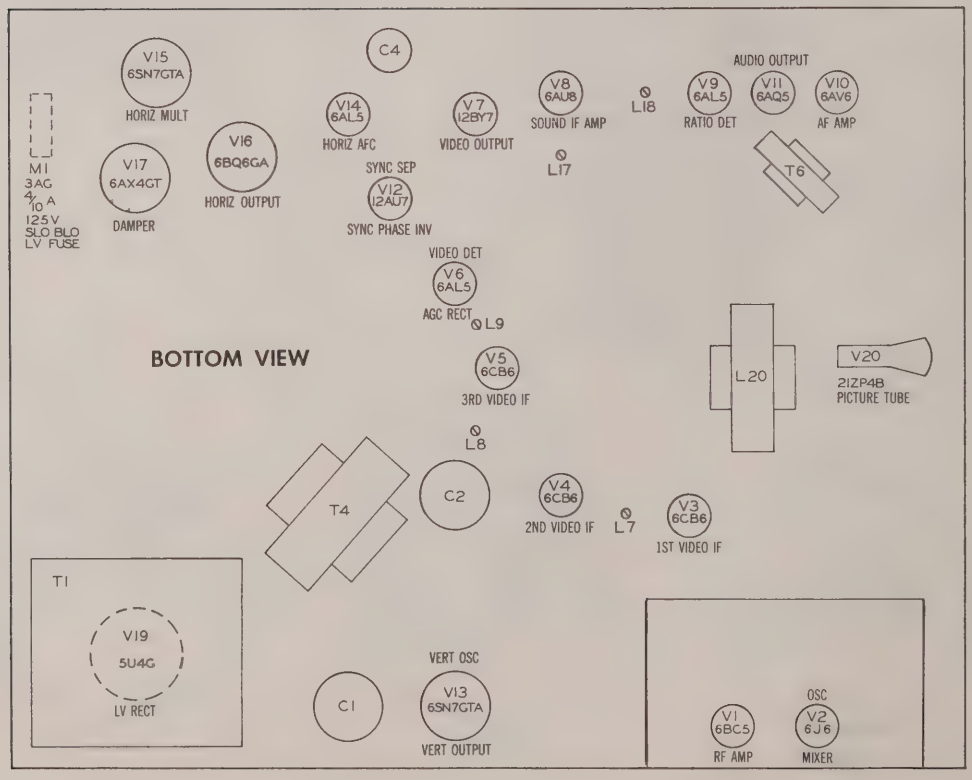


FIG. 6

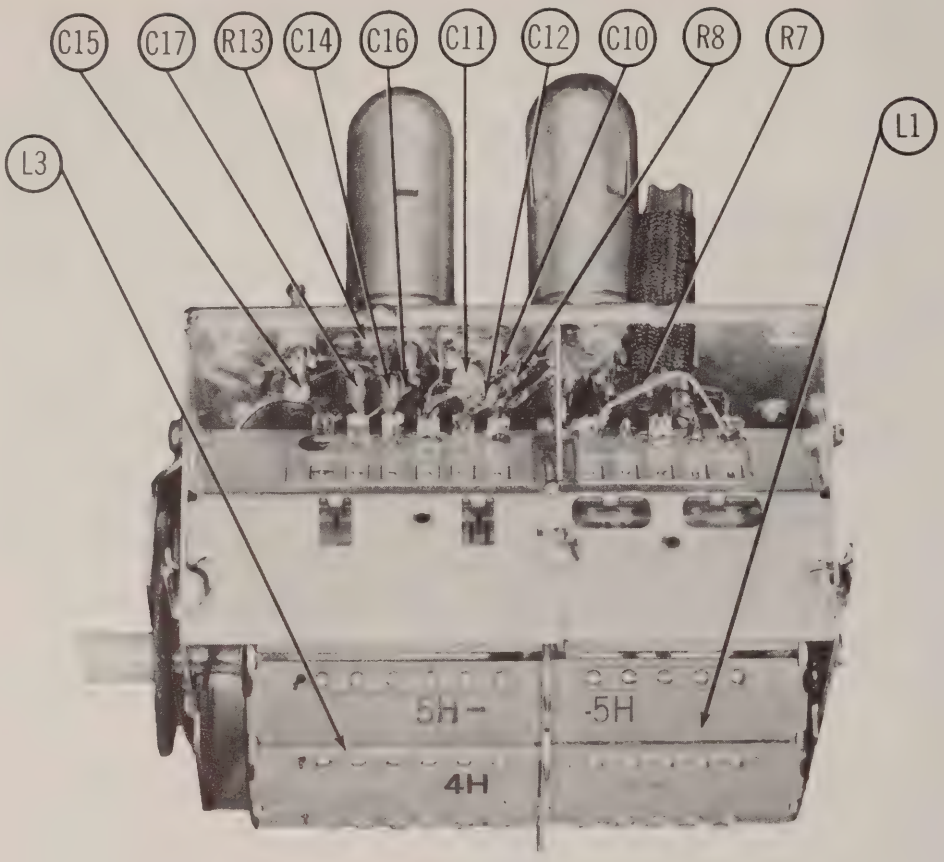
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BC5	1.5Meg	0Ω	.1Ω	0Ω	†3.5KΩ	†5.7KΩ	0Ω		
V 2	6J6	†18KΩ	†18KΩ	.1Ω	0Ω	225KΩ	10KΩ	0Ω		
V 3	6CB6	1.5Meg	47Ω	0Ω	.1Ω	†5KΩ	†5KΩ	0Ω		
V 4	6CB6	1.5Meg	47Ω	0Ω	.1Ω	†5KΩ	†5KΩ	0Ω		
V 5	6CB6	.2Ω	180Ω	0Ω	.1Ω	†3KΩ	†3KΩ	0Ω		
V 6	6AL5	700Ω	3.9KΩ	.1Ω	0Ω	.2Ω	0Ω	1Meg		
V 7	12BY7	350Ω	1Meg	0Ω	.1Ω	.1Ω	0Ω	†4KΩ	†2.5KΩ	0Ω
V 8	6AU6	56KΩ	0Ω	.1Ω	0Ω	†3.5KΩ	†25KΩ	0Ω		
V 9	6AL5	INF	INF	.1Ω	0Ω	10KΩ	0Ω	10KΩ		
V 10	6AV6	10Meg	0Ω	.1Ω	0Ω	NC	NC	†500KΩ		
V 11	6AQ5	500KΩ	330Ω	0Ω	.1Ω	†1.4KΩ	†1KΩ	500KΩ		
V 12	12AU7	†200KΩ	1.5Meg	0Ω	0Ω	0Ω	†6KΩ	45KΩ	2.2KΩ	.1Ω
V 13	6SN7GTA	2.3Meg	▲2.5Meg	160Ω	2.2Meg	▲5.5KΩ	1.8KΩ	0Ω	.1Ω	
V 14	6AL5	4.8Meg	4.8Meg	.1Ω	0Ω	10KΩ	NC	10KΩ		
V 15	6SN7GTA	5.2Meg	†4.3KΩ	1.5KΩ	220KΩ	†260KΩ	1.5KΩ	.1Ω	0Ω	
V 16	6BQ6GT	NC	0Ω	TP	†15KΩ	470KΩ	TP	.1Ω	100Ω	Top Cap ▲18Ω
V 17	6AX4GT	TP	NC	100KΩ	TP	†40Ω	NC	.1Ω	0Ω	
V 18	1B3GT	PINS 1 - 8 HAVE INFINITE RESISTANCE								Top Cap ▲340Ω
V 19	5U4G	INF	25KΩ	INF	28Ω	INF	26Ω	INF	25KΩ	
V 20	21ZP4B	0Ω	8.2KΩ	Pin 10 ▲3.3KΩ	Pin 11 †500KΩ	Pin 12 .1Ω				

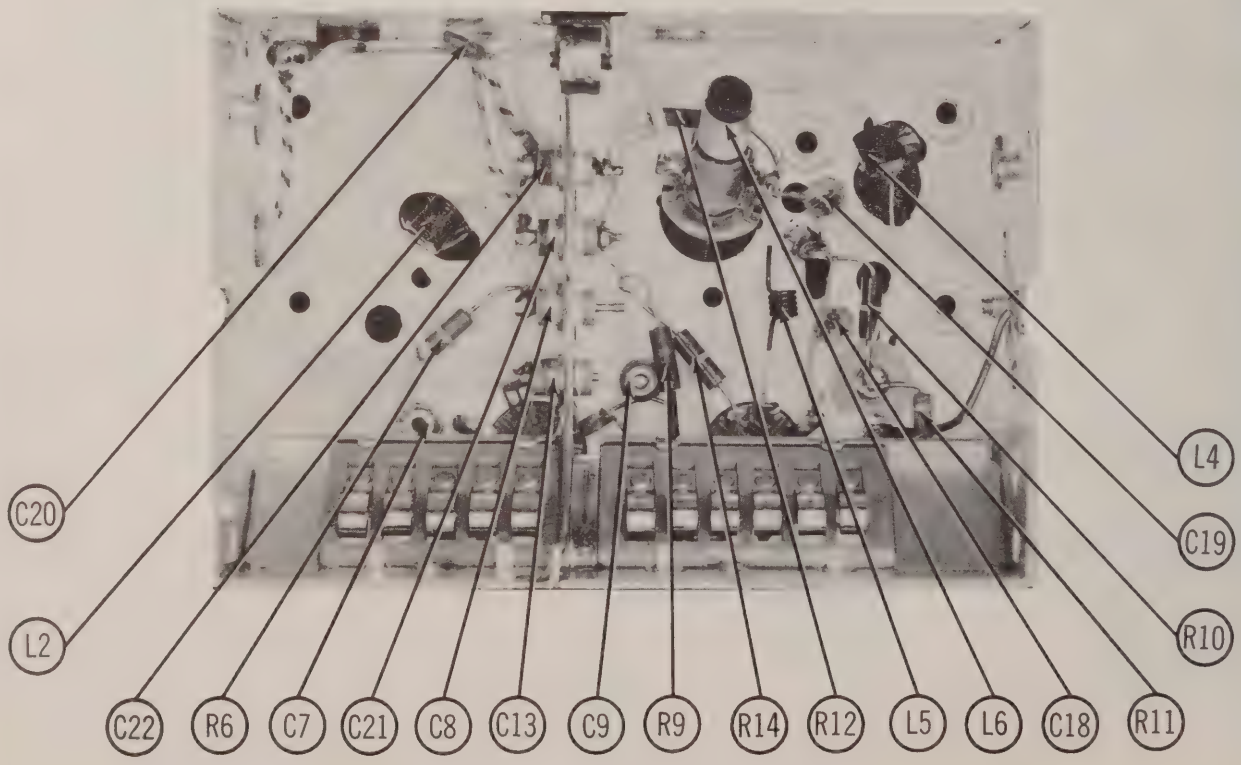
† MEASURED FROM PIN 2 OF V19.
▲ MEASURED FROM PIN 3 OF V17.
NC-NO CONNECTION
TP - TIE POINT



TUBE PLACEMENT CHART

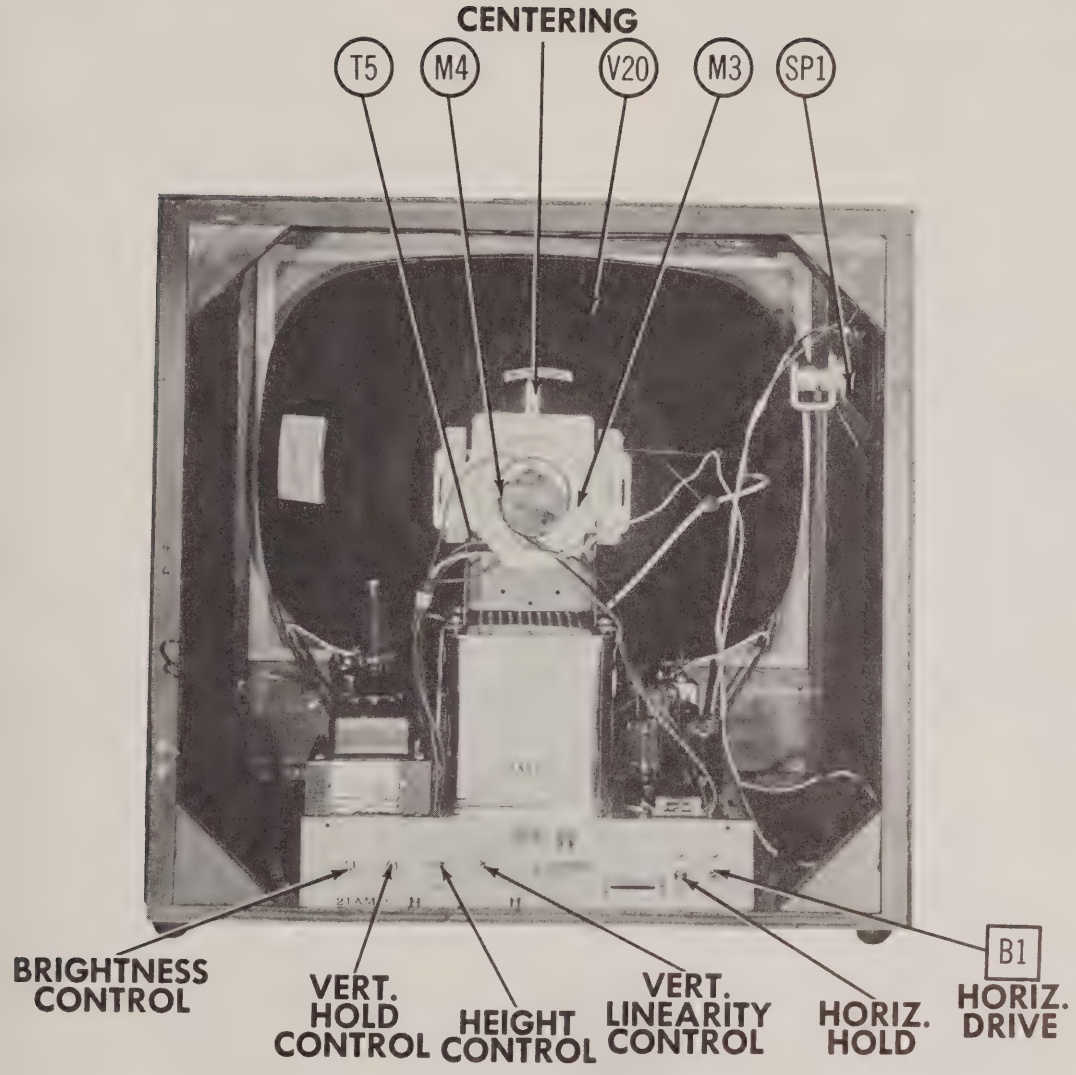


RF TUNER-RIGHT SIDE



RF TUNER-BOTTOM VIEW

DENVER, COLORADO



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station preferably a test pattern. Adjust the horizontal hold (L19) until the picture synchronizes horizontally. Switch off channel and back again. Picture should now be locked in sync. If not, slightly readjust L19.

Turn contrast control maximum counter clockwise and brightness control for maximum brightness. Turn the horizontal drive trimmer (B1) clockwise until white bars or compression near center of the raster appears. Then turn B1 counter clockwise until the white bars or compression disappears.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V16, V17 and V19. Check T3, T5A, R85, R84, C6 and other associated components.

DRIVE LINES

Check by substitution V16 and V17. Check adjustment B1. Check C67, R85, T3 and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V16 and V17. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V15, V16 and V17. Check C63 for open. Check L19, C64, R75 and other associated components.

XMAS TREE EFFECT

Check by substitution V15, V16 and V17. Check T3 and T5A for internal arcing. Check C61, C62, C65, C64, L19, R74 and other associated components.

VERTICAL

LOSS OF SWEEP

Substitute V13. Check waveform W7.

If Satisfactory	If Unsatisfactory
Check T4, T5B, R65, R5, C2B and other associated components.	Check C58, C54, T2, R80, R61, R4 and other associated components.

INSUFFICIENT SWEEP

Substitute V13. Check height and vertical linearity controls for proper operation. Check R61, T4 and other associated components.

COMPRESSED AT BOTTOM

Substitute V13. Check R80, R61, R4, T2, C55, C58 and other associated components.

COMPRESSED AT TOP

Substitute V13. Check C2B, R65, R5, T4 and other associated components.

FOLDS

Substitute V13. Check R65, R66, C58, C57 and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Substitute V12. Check C50, C51, C52, R50, R55, R54 and other associated components.

LOSS OF VERTICAL SYNC - HORIZONTAL SYNC SATISFACTORY

Substitute V13. Check vertical integrator network. Check C54, T2, R60, R59, R3 and other associated components.

LOSS OF HORIZONTAL SYNC - VERTICAL SYNC SATISFACTORY

Check by substitution V14 and V15. Check C59, C60, C62, C64, L19, R74 and other associated components.

HORIZONTAL BENDING

Check by substitution V12, V14 and V15. Check horizontal AFC network.

VIDEO

LOSS OF VIDEO

Substitute V7. Check C37, C38, C39, R33, R32, R31 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A9. Check video IF alignment.

POOR CONTRAST

Substitute V7. Check L14, L15, C37, C39, R31 and other associated components.

NEGATIVE PICTURE

Substitute V7. Check picture tube. Check video detector network. Check C37, C39 and other associated components.

SMEAR

Substitute V7. Check L11, L12, L14, L15, C37, C39 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V1, V3, V4, V5, V6 and V7 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V8, V9, V10 and V11. Check stages V10 and V11 using audio signal generator. Apply audio signal across R1B.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF stages for component failure or change of value.	Check C46, C47, C48A, C49, C4B, C4A, R47, R46, R45A, T6, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A8 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or No Sound".

POWER

DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, check M1 fuse. Substitute V19. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Substitute V19. Check B+ filter and decoupling network.

PROPERTY OF
L. F. BLANKENSHIP
3924 WEST 3T.
DENVER, COLORADO

CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

WELLS-GARDNER MODELS 321AM49-A-436,
321AM49-A-470, 2321AM49-A-438, 2321AM49-A-494

L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No	USE	REPLACEMENT DATA: Wells-Gardner Part No.	STANDARD REPLACEMENT	RETMA BASE TYPE
V1	RF Amplifier	6BC8	6BC8	7BD
V2	Osc.-Mixer	6J8	6J8	7BF
V3	1st. Video IF Amp.	6CB6	6CB6	7CM
V4	2nd. Video IF Amp	6CB6	6CB6	7CM
V5	3rd. Video IF Amp.	6CB6	6CB6	7CM
V6	Video Detector-AGC Rectifier	6AL5	6AL5	6BT
V7	Video Output	12BT7	12BT7	9BF
V8	Sound IF Amp.	6AU8	6AU8	7BX
V9	Ratio Detector	6AL5	6AL5	6BT
V10	AF Amplifier	6AV6	6AV6	7BT
V11	Audio Output	6AQ8	6AQ8	7BZ
V12	Sync Separator-Sync Phase Inv.	12AU7	12AU7	9A
V13	Vert. Osc.-Vert. Output	6SN7GTA	6SN7GTA	8BD
V14	Horiz. AFC	6AL5	6AL5	6BT
V15	Horiz Osc.	6SN7GTA	6SN7GTA	8BD
V16	Horiz. Output	6BQ6GT	6BQ6GT	6AM
V17	Damper	6AX4GT	6AX4GT	6CG
V18	HV Rectifier	1B3GT	1B3GT	3C
V19	LV Rectifier	5U4G	5U4G	5T

CATHODE-RAY TUBE

ITEM No	REPLACEMENT DATA: Wells-Gardner Part No.	CBS HYTRON Part No.	GENERAL ELECTRIC Part No.	SYLVANIA Part No.	WESTINGHOUSE Part No.	RETMA BASE TYPE	NOTES
V20	21ZP4B ⓘ	21ZP4B ⓘ	21ZP4B ⓘ	21ZP4B ⓘ ⓙ 21ZP4A 21ZP4 ⓘ ⓚ	21ZP4B ⓘ ⓙ 21ZP4A 21ZP4 ⓘ ⓚ	12N 12N 12D	ⓘ Aluminized ⓙ Circuit changes necessary

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: Wells-Gardner Part No.	CENTRALAB Part No.	ERIE Part No.	MALLORY Part No.	FYRAMID Part No.	SANGAMO Part No.	NOTES
C1A	+80 -20	300	45X397			FP239.4	TM-D80-350	T-180	
B	+80 -20	300	45X398			FP239.8	TM-3057	D-323	
C2	5	25	45X378			TC20	TD-5-25	MMT-0505	
C4A	+20 -10	350	45X410			FP230	TM-30-300 TD-50-50	T-696	Note 1
B	+40 -50								
C5	30	400	45X393			TC77	TD-30-450	FM-4530	
C6	5	25	45X378			TC20	TD-5-25	MMT-0505	
C7	3-8		31A-079	839-10					
C8	800		33D-153						
C9	5-3		31A-056	839-3	3115-01-GR5	CT565A			
C10	1000		31LEX102Z	DD-102	801-001	DC-521		K-1210	
C11	120		31LED12K	D6-121	811-131	UC-5312			
C12	120		31LED12K	D6-121	811-131	UC-5312			
C13	800		33D-153						
C14	120		31LED12K	D6-121	811-131	UC-5312			
C15	5-3		31A-056	839-3	3115-01-GR5	CT565A			
C16	10		31LDC100K	TC2-10	NP0K-100	UT-541		K-1210	
C17	5		31LSU505C						
C18	1000		31LEX102Z	DD-102	801-001	DC-521		K-1210	
C19	10		31LDC100K	TC2-10	NP0K-100	UT-541		K-1210	
C20	120		31LED12K	D6-121	811-131	UC-5312			
C21	800		33D-153						
C22	800		33D-153						
C23	1000		50X1	DD-102	801-001	DC-521		K-1210	
C24	1000		50X1	DD-102	801-001	DC-521		K-1210	
C25	1000		50X1	DD-102	801-001	DC-521		K-1210	
C26	1000		50X1	DD-102	801-001	DC-521		K-1210	
C27	1000		50X1	DD-102	801-001	DC-521		K-1210	
C28	1000		50X1	DD-102	801-001	DC-521		K-1210	
C29	1000		50X1	DD-102	801-001	DC-521		K-1210	
C30	1000		50X1	DD-102	601-001	DC-521		K-1210	
C31	15		47X805	D6-150	GP3K-150	UC-5415		K-1415	
C32	.22	200	RCP10M2224M			PT4033	IMP2-P22	3302022	
C33	1000		50X1	DD-102	801-001	DC-521		K-1210	
C34	1000		50X1	DD-102	801-001	DC-521		K-1210	
C35	5		47X563	TC2-4.7	NP0A-050	Z7-555		KR-1550	
C36	5		47X562	TC2-4.7	NP0A-050	Z7-555		KR-1550	
C37	.047	200	RCP10M4738M	DF-505		PT4147	IMP2-647	3302147	
C38	30	400	47X868						
C39	.1	400	RCP10M4104M	DF-104		PT401	IMP4-P1	330401	
C40	1.5		47X584	TC2-1.5	NP0A-1R5	Z7-5515			
C41	100		47X604	D6-101	GP1K-101	UC-531		K-1310	
C42	5000		47X707	DD-502	811-008	DC-525		C-1250	
C43	5000		47X507	DD-502	811-008	DC-525		C-1250	
C44	330	500	47X370					KR-1333	
C45	470	500	47X525	D6-471	GP3K-471	MC345		K-1547	
C46	.047	200	RCP10M4738M	DF-505		PT4147	IMP2-647	3302147	
C47	1000		47X507	DD-502	811-008	DC-525	IMP6-D5	C-1250	
C48A	10000								
B	350		†78X5	†PC-90	†1404-01				
C									
C49	.0047	600	RCP10M4732M	D6-472	GP3-333-472	PT6347	IMP6-D47	3306347	
C50	330	500	47X370	D6-331	GP3K-331	UC-5333		K-1333	
C51	.01	400	RCP10M4103M	D6-103	GP3-333-103	PT411	IMP4-81	330411	
C52	.047	400	RCP10M4473M	DF-505		PT4147	IMP4-647	3304147	
C53A	2000					DC-522	IMP6-D2	C-1230	
B	5000		‡78X7	‡PC-100	‡1405-01	DC-525	IMP6-D5	C-1250	
C	5000					DC-525	IMP6-D5	C-1250	
C54	.01	400	RCP10M4103M	D6-103	GP3-333-103	PT411	IMP4-81	330411	
C55	.022	200	RCP10M2233M	DF-503	817-02	PT4122	IMP4-P22	3304122	

CAPACITORS (cont)

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: Wells-Gardner Part No.	CENTRALAB Part No.	ERIE Part No.	MALLORY Part No.	FYRAMID Part No.	SANGAMO Part No.	NOTES
C56	.047	600	RCP10M6473M	DF-503		PT6147	IMP6-647	3306147	
C57	.022	200	RCP10M2233M	DF-203	817-02	PT4122	IMP2-S22	3304122	
C58	.1	600	RCP10M6104M	DF-104		PT601	IMP6-P1	330601	
C59	1000		50X1	DD-102	801-001	DC-521	IMP6-D1	K-1210	
C60	1000		50X1	DD-102	801-001	DC-521	IMP6-D1	K-1210	
C61	.01	400	RCP10M4103M	D6-103	GP3-333-103	PT411	IMP4-81	330411	
C62	.0047	400	RCP10M4732M	D6-472	GP3-333-472	PT6347	IMP6-D47	3306347	
C63	.047	200	RCP10M2473M	DF-503		PT4147	IMP2-647	3302147	
C64	4700	500	47X543			MCB3465		CR-1347	
C65	430	500	RCM2D431K					KR-1343	
C66	.047	600	RCP10M6473M	DF-503		PT4147	IMP4-S47	3304147	
C67	330	500	47X370					KR-1333	
C68	.047	400	RCP10M4473M	DF-503		PT4147	IMP4-647	3304147	
C69	.1	400	RCP10M4104M	DF-104		PT401	IMP4-P1	330401	
C70	.15	600	RCP10M6154M			PT4015	IMP4-P15	3304015	
C71	10000	1000	47X615						
C72	10000	1000	47X615						

Note 1. Some versions use 10MFD for C4A.
† Items C48A, C48B, C48C, R45A, R45B are combined in one unit.
When replacing items separately C48B and C48C should total 350MMF.
* Items C53A, C53B, C53C, R57A, R57B, and R57C are combined in one unit.

CONTROLS

ITEM No	RATING: RESISTANCE	WATTS	REPLACEMENT DATA: Wells-Gardner Part No.	IRC Part No.	CLAROSTAT Part No.	CENTRALAB Part No.	MALLORY Part No.	INSTALLATION NOTES
R1A	10000	½	B73X21	*QJ-638	RTV-502	F1-4	UF131	Contrast - Panel
B	1Meg	½				B2-58	UR16-T254	Volume tapped at 250KΩ - Rear
C	Switch					K3-3	US-27	Attach to R1B
R2A	500KΩ	½	B40X385	Q11-133	A47-500K-S	BX-59	SU-50	Brightness
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R2A
R3A	1.5Meg	½	B40X386	Q11-130	A47-1.5Meg-S	BX-743	U-185	Vert. Hold
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R3A
R4A	2.5Meg	½	B40X389A	Q11-139	A47-2.5Meg-S	AB-48	SU-50	Height
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-4	Not Req.	Attach to R4A
R5A	8000Ω	½	B40X375	Q11-116	A47-10K-S	AB-14	SU-30	Vert. Linearity
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Not Req.	Attach to R5A

* CONCENTRIKIT EQUIVALENT: KIT K-4, BASE ELEMENT 0 & SHAFTS: B1-105 & P8-218 (PANEL)
B13-137X & R16-313 (REAR)
76-3 SWITCH

RESISTORS

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: Wells-Gardner Part No.	IRC Part No.	NOTES
R6	47KΩ	½		BTS-47K	
R7	15KΩ	½		BTS-15K	
R8	2200Ω	½		BTS-2200	
R9	1000Ω	½		BTS-1000	
R10	2300Ω	½		BTS-2300K	
R11	4700Ω	½		BTS-4700	
R12	15KΩ	½		BTS-15K	
R13	10KΩ	½		BTS-10K	
R14	15KΩ	½		BTS-15K	
R15	6200Ω 5%	½	B83822	BTS-6200 5%	
R16	470Ω	½	B83470	BTS-470	
R17	1000Ω	½	B85102	BTS-1000	
R18	1000Ω	½	B85102	BTS-1000	
R19	22KΩ 5%	½	B83323	BTS-22K 5%	
R20	470 5%	½	B83470	BTS-47 5%	
R21	1000Ω	½	B85102	BTS-1000	
R22	4000Ω	½	43X388	1 3/4A-4000	
R23	22KΩ 5%	½	B83323	BTS-22K 5%	
R24	180Ω	½	B8481	BTS-180	
R25	470Ω	½	B85471	BTS-470	Note 1
R26	470KΩ	½	B85474	BTS-470K	
R27	1Meg	½	B84105	BTS-1Meg	
R28	47KΩ	½	B84473	BTS-47K	
R29	3900 5%	½	B83392	BTS-3900 5%	
R30	1Meg	½	B84105	BTS-1Meg	
R31	47Ω	½	B84470	BTS-47	
R32	2000 5%	2	B83202	BTB-2000 5%	
R33	2000 5%	3	B83202	BTB-2000 5%	
R34	100KΩ	½	B84103	BTS-10K	
R35	470KΩ	½	B84474	BTS-470K	
R36	56KΩ	½	B84563	BTS-56K	
R37	33KΩ	½	B84333	BTS-33K	
R38	100KΩ	½	B84103	BTS-10K	
R39	33KΩ	½	B84333	BTS-33K	
R40	270Ω	½	B84271	BTS-270	
R41	150KΩ	½	B84154	BTS-150K	
R42	10KΩ 5%	½	B83103	BTS-10K 5%	
R43	10KΩ 5%	½	B83103	BTS-10K 5%	
R44	10Meg	½	B85106	BTS-10Meg	
R45A	500KΩ	½		BTS-470K	
B	500KΩ	½	†78X5	BTS-470K	
R46	330Ω	1	C8435L	BTA-330	
R47	1000Ω	2	B84102	BTB-1000	
R48	150KΩ	½	B84154	BTS-150K	

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: Wells-Gardner Part No.	IRC Part No.	NOTES
R49	1.5Meg	½	B84155	BTS-1.5Meg	
R50	820KΩ	½	B84824	BTS-820K	
R51	270KΩ	½	B84274	BTS-270K	
R52	47KΩ	½	B84473	BTS-47K	
R53	33000 5%	1	B83323	BTS-3300 5%	
R54	1500Ω	½	B84153	BTS-1500	Note 2
R55	2200Ω 5%	½	B83222	BTS-2200 5%	
R56	1Meg	½	B84105	BTS-1Meg	
R57A	22KΩ	½		BTS-22K	
B	8700Ω	½	+76X7	BTS-8200	
C	8200Ω	½		BTS-8200	
R58	22KΩ	½	B84223	BTS-22K	
R59	1.5Meg	½	B84155	BTS-1.5Meg	Note 3
R60	22KΩ	½	B84223	BTS-22K	
R61	1.5Meg	½	B84155	BTS-1.5Meg	
R62	2.2Meg	½	B84225	BTS-2.2Meg	
R63	120KΩ	½	B84124	BTS-120K	Note 4
R64	2.2Meg	½	B84225	BTS-2.2Meg	
R65	820Ω	½	B84821	BTS-820	
R66	8200Ω	½	B84822	BTS-8200	
R67	560Ω	½		BTS-560	
R68	100KΩ	½	B84104	BTS-100K	
R69	4.7Meg	½	B85475	BTS-4.7Meg	
R70	100KΩ	½	B84104	BTS-100K	
R71	18KΩ	1	C8418S	BTA-18K	
R72	27KΩ	1	B84273	BTS-27K	
R73	470KΩ	½	B85474	BTS-470K	
R74	1500Ω 5%	½	B83153	BTS-1500 5%	
R75	4300Ω 5%	1	C8343S	BTA-4300 5%	
R76	220KΩ	½	B84224	BTS-220K	
R77	220KΩ	½	B84224	BTS-220K	
R78	47KΩ	1	C8447S	BTA-47K	
R79	47KΩ	1		BTA-47K	
R80	3300Ω	1	C8433S	BTA-3300	
R81	8200Ω	½	B84822	BTS-8200	
R82	470KΩ	½	B84474	BTS-470K	
R83	68Ω	2	B85680	BTS-68	
R84	100Ω	2	B84101		
R85	15KΩ	2	B84153	BTB-15K	
R86	5600Ω	½	B84562	BTS-5600	
R87	3.3Ω	5	43X322		
R88	2500Ω	10	43X387	1 3/4A-2500	
R89	100KΩ	2	B85104	BTB-100K	
R90	270KΩ	½	B85274	BTS-270K	

† Items R45A, R45B, C48A, C48B and C48C are combined in one unit.
* Items R57A, R57B, R57C, C53A, C53B and C53C are combined in one unit.
Note 1: Some versions may use a 1500Ω resistor in this application.
Note 2: Some versions may use a 3300Ω resistor in this application.
Note 3: Some versions may use a 3.3Meg resistor in this application.
Note 4: Some versions may use a 220KΩ resistor in this application.

TRANSFORMER (POWER)

ITEM No	RATING: PRI.	SEC. 1	SEC. 2	Wells-Gardner Part No.	Stancor Part No.	Merit Part No.	Triad Part No.	RCA TYPE No.	Halldorson Part No.	Thordarson Part No.
T1	117VAC ⓐ 1.4A	518VCT .230VDC	5VAC ⓑ 2A	53X340A						
	SEC. 3	SEC. 4	SEC. 5							
	6.3VAC ⓒ 8.3A									

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA: Wells-Gardner Part No.	Halldorson Part No.	Merit Part No.	RCA TYPE No.	Ram Part No.	Stancor Part No.	Thordarson Part No.	Triad Part No.
T2	Vert. Osc. Trans.	54X10	B6702	A-3003	209T1 ⓘ	Y405	A-8125	24A87 ⓘ	A-97X
T3	Horiz. Output Trans.	53X342	FB41H ⓘ	HV0-P ⓘ	232T1 ⓘ	X110*	A-8255* ⓘ	F1Y-37*	D-35* ⓘ
T4	Vert. Output Trans.	51X188	21B06 ⓘ	A-3038 ⓘ	228T1 ⓘ	V312 ⓘ	A-8241 ⓘ	28S54 ⓘ	A-30X ⓘ
T5A	Yoke-Horiz. (13MH)	9A2334-1 ⓘ	DF-502 ⓘ	MDF-72 ⓘ	211D2 ⓘ	T70F14 ⓘ	DY-8A ⓘ	T-4 ⓘ	Y-17 ⓘ
B	Vert. (46MH)								

ⓘ Drill new mounting hole(s).
ⓙ Use original yoke network and connect as in original circuit.
ⓚ Includes resistor R67.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
	6	9	9	10	13	9	13	10
					Jumper		Jumper	
	5	8	8	8	10 & 11	8	10 & 11	8
	4	5	6	6	5	5	6	6
	3	See Note ⓒ	See Note ⓒ	See Note ⓒ	5 or 4	See Note ⓒ	5 or 4	See Note ⓒ
	1	RF600 Term #2	MWC-1 Orange Term	1	9	WC-3 Black Term	9	1
	A	RF600 Term #4	MWC-3 Black Term	2	8	WC-5 Orange Term	8	2
Connect Width Coil Asmy. →	G	RF600 Terms #1 & #2 across 3 & 1	MWC-1 Terms blue & red across 3 & 1			WC-5 Terms blue & red across 3 & 1		
Special Note: ↓		4 & 5	4 & 5	4		4 & 5		4 & 5

ⓒ Connect a 47 or 56MMF capacitor from terminal #5 to open end of R88 (original terminal #3 connection).
ⓘ If the picture is out of phase, reverse width coil primary or secondary.
ⓙ Jumper terminals #9 & "P".

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	SEC	Wells-Gardner Part No.	Stancor Part No.	Merit Part No.	Triad Part No.	Halldorson Part No.	Thordarson Part No.	NOTES
T6	4.75KΩ	2.7Ω	51X187	A-3877	A-3026	S-6X	Z1107	34S51	

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V. C. IMP.	Wells-Gardner Part No.	JENSEN Part No.	QUAM Part No.	NOTES
SP1	6"	PM	3.7Ω	12A516	ST-108	6A2I	ⓘ Used in console models.
	8"	PM	3.7Ω	12A522 ⓘ	Mod. P6-X ST-118 Mod. P8-V	8A2I	

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	SEC.	REPLACEMENT DATA: Wells-Gardner Part No.	MEISSNER Part No.	MERIT Part No.	MILLER Part No.	NOTES
L1A	Ant. Coil	0Ω CT	0Ω	9A2337-2				Channel 2
B	Ant. Coil	0Ω CT	0Ω	9A2337-3				Channel 3
C	Ant. Coil	0Ω CT	0Ω	9A2337-4				Channel 4
D	Ant. Coil	0Ω CT	0Ω	9A2337-5				Channel 5
E	Ant. Coil	0Ω CT	0Ω	9A2337-6				Channel 6
F	Ant. Coil	0Ω CT	0Ω	9A2337-7				Channel 7
G	Ant. Coil	0Ω CT	0Ω	9A2337-8				Channel 8
H	Ant. Coil	0Ω CT	0Ω	9A2337-9				Channel 9
I	Ant. Coil	0Ω CT	0Ω	9A2337-10				Channel 10
J	Ant. Coil	0Ω CT	0Ω	9A2337-11				Channel 11
K	Ant. Coil	0Ω CT	0Ω	9A2337-12				Channel 12
L	Ant. Coil	0Ω CT	0Ω	9A2337-13				Channel 13
L2	Fil. Choke	0Ω		54A-546				
L3A	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-2				Channel 2
B	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-3				Channel 3
C	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-4				Channel 4

WELLS-GARDNER MODELS 3211AM49-A-436, 3211AM49-A-470, 2321AM49-A-438, 2321AM49-A-494

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA Wells-Gardner PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
D	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-5				Channel 5
E	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-6				Channel 6
F	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-7				Channel 7
G	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-8				Channel 8
H	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-9				Channel 9
I	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-10				Channel 10
J	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-11				Channel 11
K	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-12				Channel 12
L	RF, Mixer Grid & Osc. Coils	0Ω		9A2338-13				Channel 13
L4	Fil. Choke	0Ω		34A-575				
L5	RF Choke	0Ω		31B638-1				
L6	1st. Video IF	.9Ω		31A-078				
L7	2nd. Video IF	.2Ω	.2Ω	9A2230	17-1062	TV-116	6249	
L8	3rd. Video IF	.2Ω	.2Ω	9A2230	17-1063	TV-116	6250	
L9	4th. Video IF	.2Ω	.2Ω	9A2333				Includes 21.7MC trap
L10	Fil. Choke	0Ω		9A2033	19-1002		4606	2.2 Microhenries
L11	Series Peaking Coil	8Ω		36A30	19-3075		4630	60 Microhenries
L12	Series Peaking Coil	10Ω		36A1	19-3100	TV-181	6177	100 Microhenries
L13	4.5MC Trap	3.2Ω		9A2336	20-1004	TV-151	1469	
L14	Series Peaking Coil	20Ω		36A28	19-3300 *	TV-190 *	6155 *	350 Microhenries, wound on 6.8KΩ resistor
L15	Shunt Peaking Coil	14.5Ω		36A29	19-3180 ■	TV-184 ■	6154 ■	190 Microhenries, wound on 4.7KΩ resistor
L16	Series Peaking Coil	10Ω		36A1	19-3100	TV-181	6177	100 Microhenries
L17	Sound IF	2.3Ω		9A2201	17-3495	TV-113	6203	
L18	Ratio Detector	4Ω	.6ΩCT	9A2295	17-3497	TV-115	6205	Tertiary winding -.5Ω
L19	Horiz. Osc.	65Ω		9A2273	19-1576	TV-163	6210	

* Parallel with 6.8KΩ resistor.
■ Parallel with 4.7KΩ resistor.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA Wells-Gardner PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.
L20	.230A	40.6Ω	.83HY	52X95	C-2326 ①	C-2996 ①	C-23X ①	C5037 ①	26C44

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA Wells-Gardner PART No. FUSE	Wells-Gardner PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1	3AG S/B	4/10A 125V	16X147-3	16X146	313.400 (3AG-S/B-4/10A)	357001	MDL 4/10	4405

MISCELLANEOUS

ITEM No.	PART NAME	Wells-Gardner PART No.	NOTES
M2	Tuner	25A1120	VHF
M3	Focus Magnet	2A438-3	Includes centering device
M4	Ion Trap	2A421	
B1	Trimmer Cap.	17A289	Horiz. Drive (120-400MMF)
	Knob	10A820-2	Beige - Fine tuning
	Knob	10A840-2	Beige - Contrast
	Knob	10A812-3	Beige- Channel Selector
	Knob	10A841-2	Beige - On-off- volume
	Knob	10A820-1	Maroon - Fine tuning
	Knob	10A840-1	Maroon - Contrast
	Knob	10A812-1	Maroon - Channel Selector
	Knob	10A841-1	Maroon - On-off-volume
	Safety Glass	17X181	
	Mask	4X1230-1	

TROUBLE SHOOTING AIDS (cont)

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V15, V16, V17 and V18. Check waveform W14.

If Satisfactory	If Unsatisfactory
Check T3, T5A, C69, C70, C68, R85, R84 and other associated components.	Check L19, C62, C64, C65, R78, R77, R75 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V16, V17 and V19. Check R85, C65 and C6. Check adjustment B1 and other associated components.

BLOOMING

Check by substitution V16, V17, V18 and V19. Check C67, C6, C65, R85, R81 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or No Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V1, V2, V3, V4, V5, V6 and V7. Check video IF components for failure or change of value.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

KEYSTONE EFFECT

Check T5 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs. The adjustments are accessible, one at a time, thru the small hole in the cabinet to the right of the channel selector shaft.

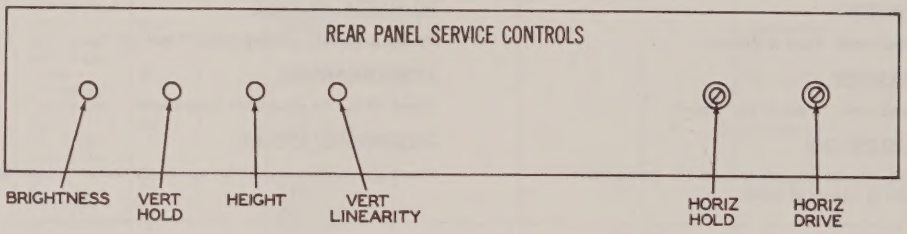
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass, remove 5 wood screws holding metal strip at top of safety glass. Remove metal strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator (L19) can be made from rear panel of the chassis. L19 is used as the horizontal hold control. Adjust L19 until picture synchronizes horizontally . Check by switching off channel and back again.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L18) located on top of the chassis. (See tube placement chart for location).

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

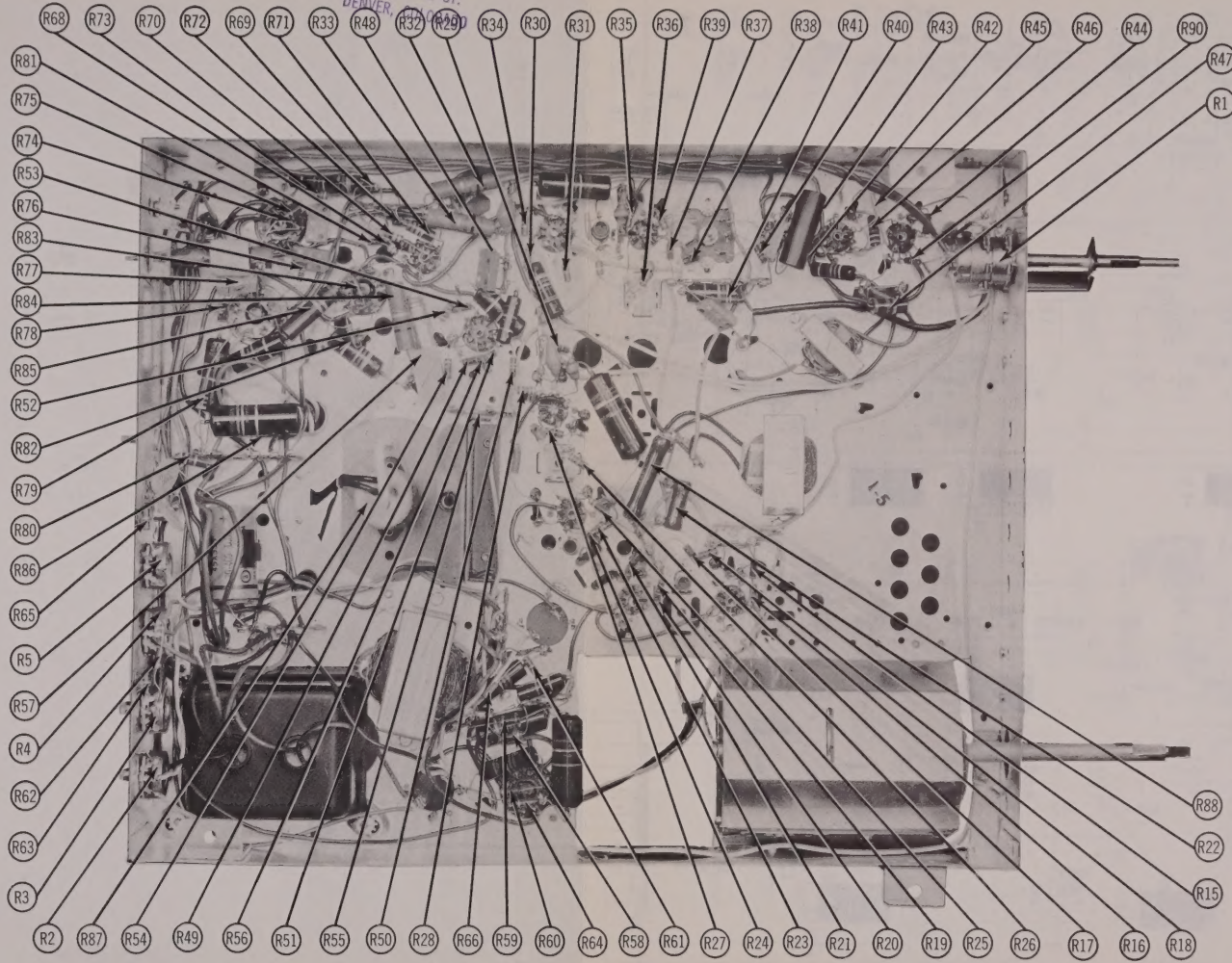
CENTERING

Centering is accomplished mechanically by means of a centering lever on the PM focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

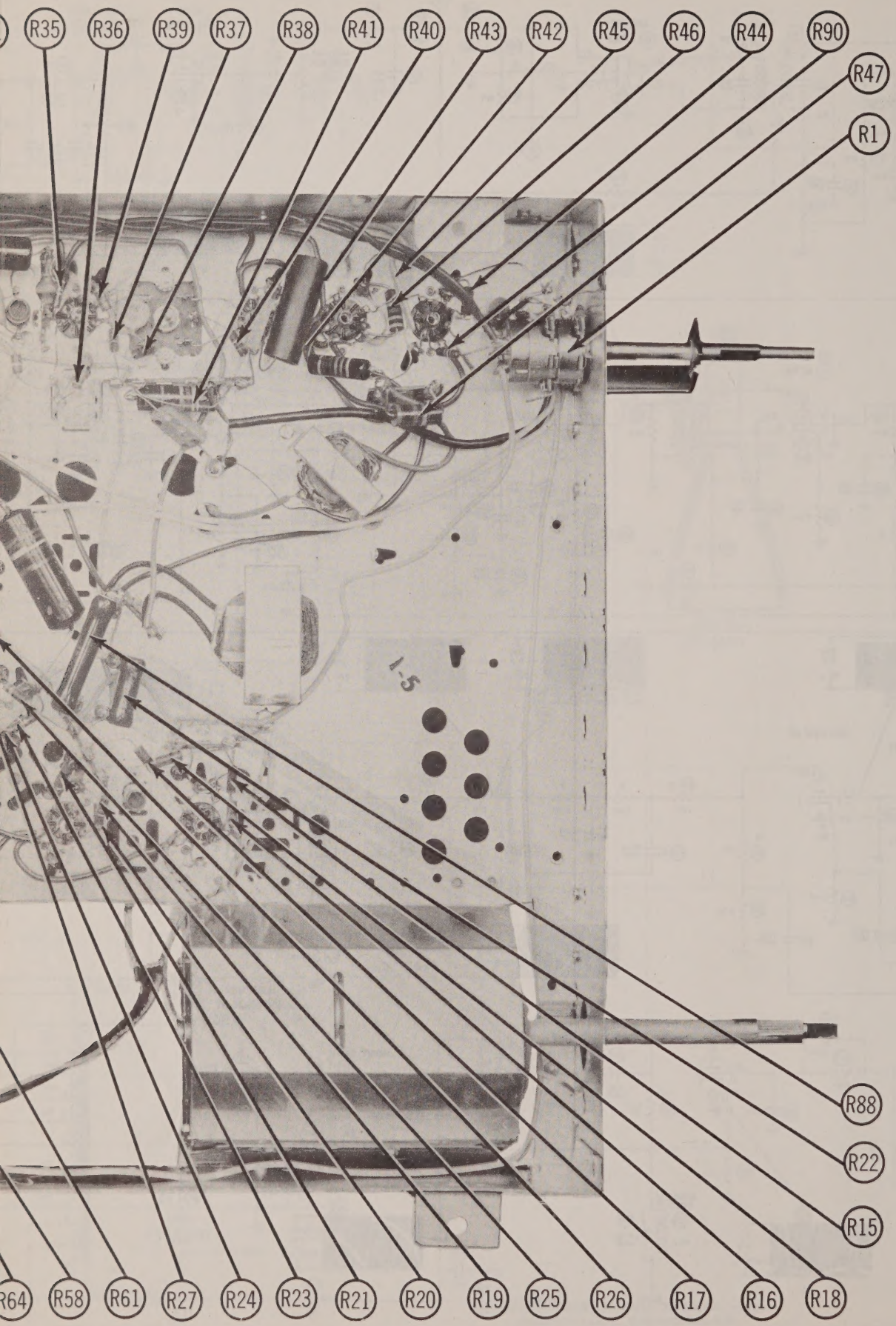
DISASSEMBLY INSTRUCTIONS

1. Remove 4 push-on type control knobs from front panel of cabinet.
2. Remove 4 wood screws. Remove rear cover.
3. Disconnect speaker leads.
4. Remove 5 chassis bolts. Remove chassis.
5. Remove 4 speaker nuts. Remove speakers.

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION



W-RESISTOR IDENTIFICATION